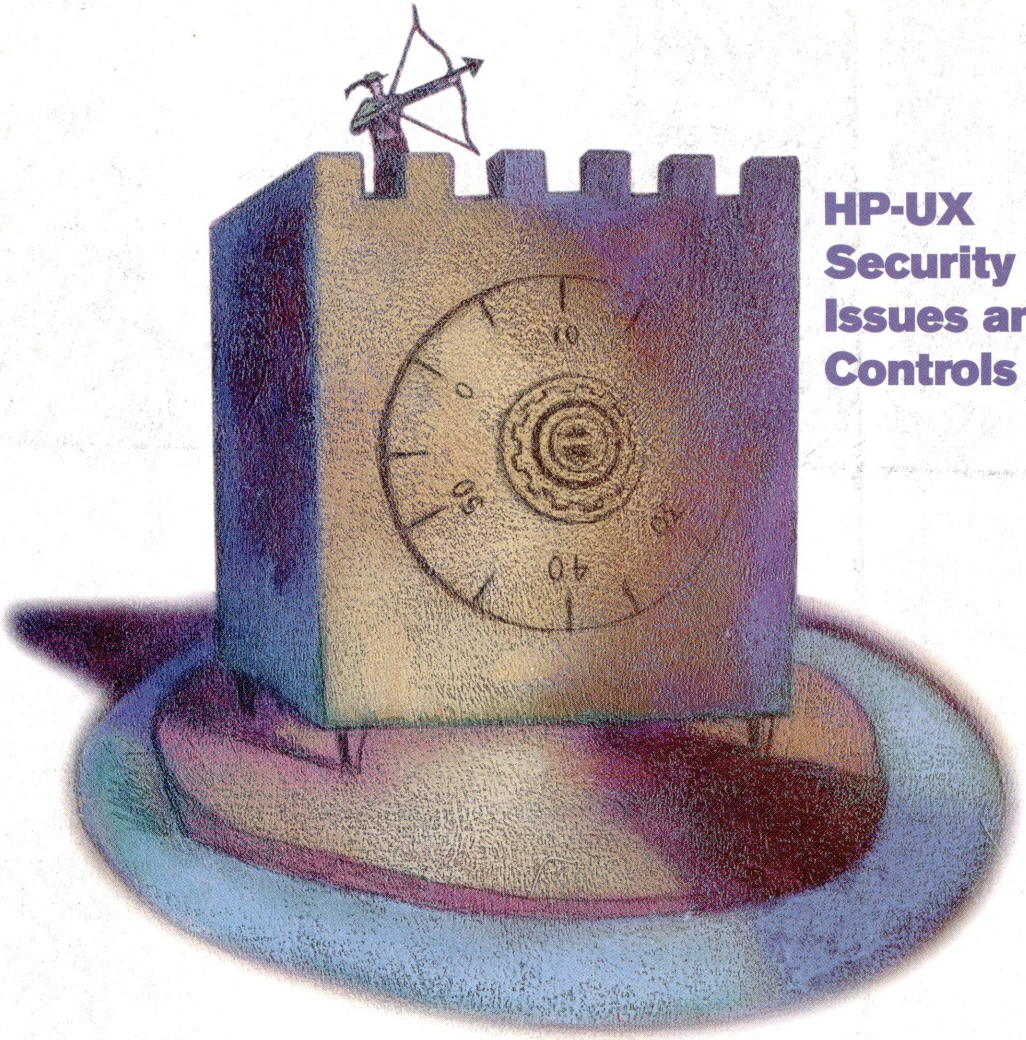
# hp-ux/usr

Hands-On Solutions for HP-UX Users • March 1993



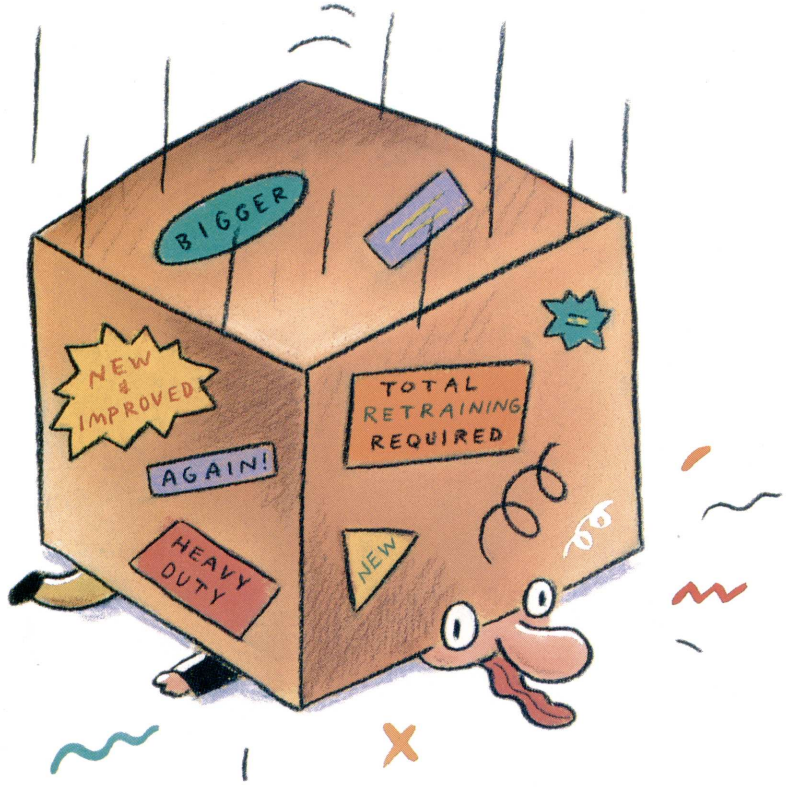
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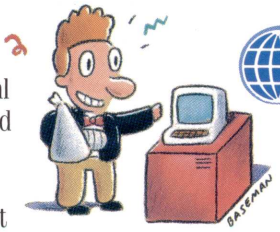



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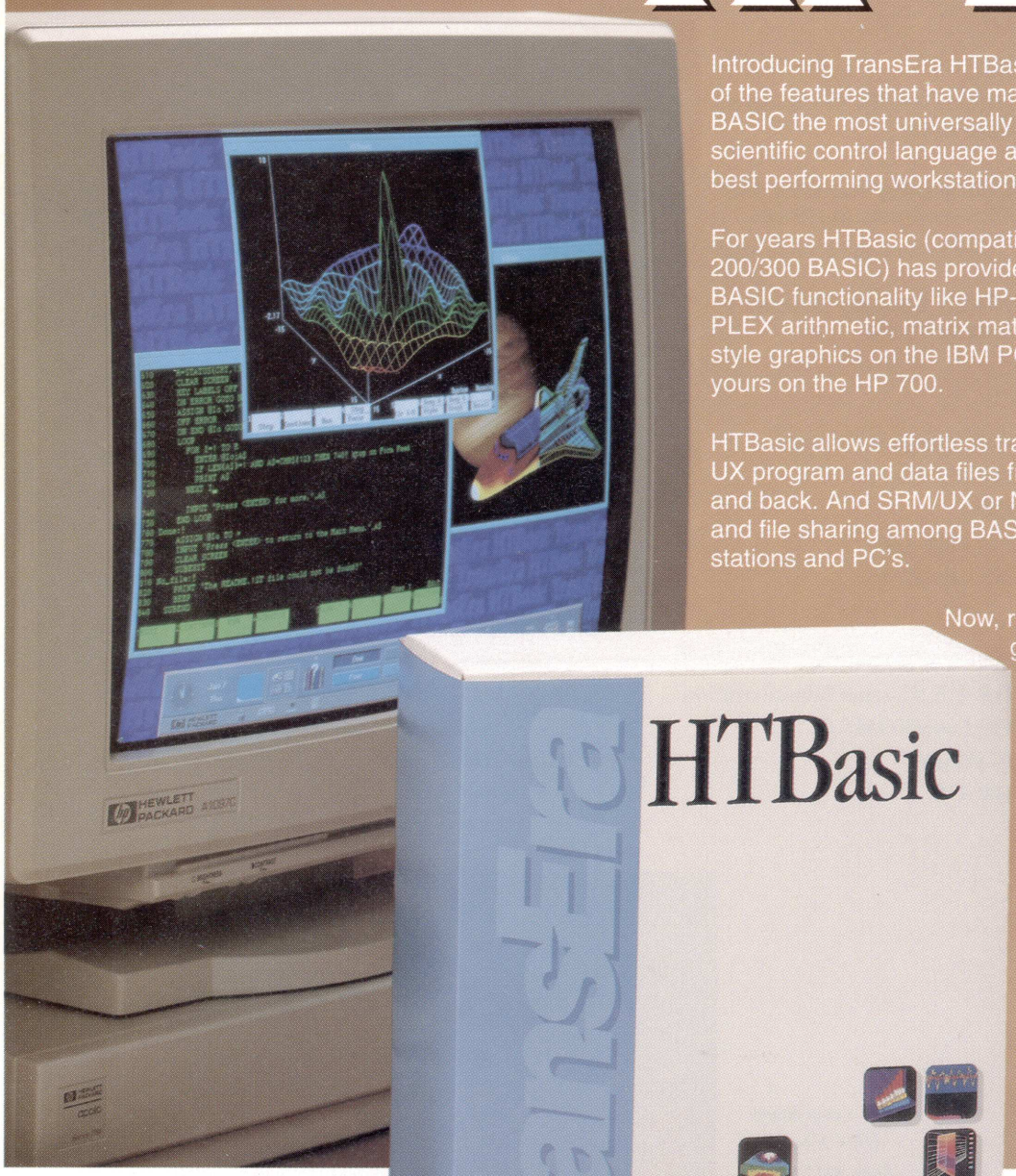

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*March 1993*

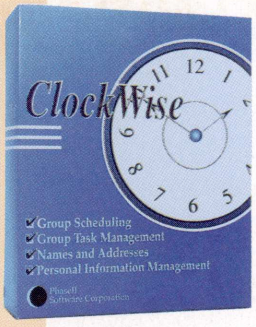
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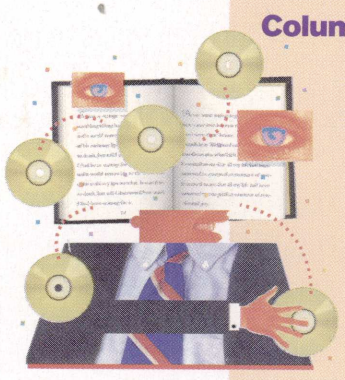

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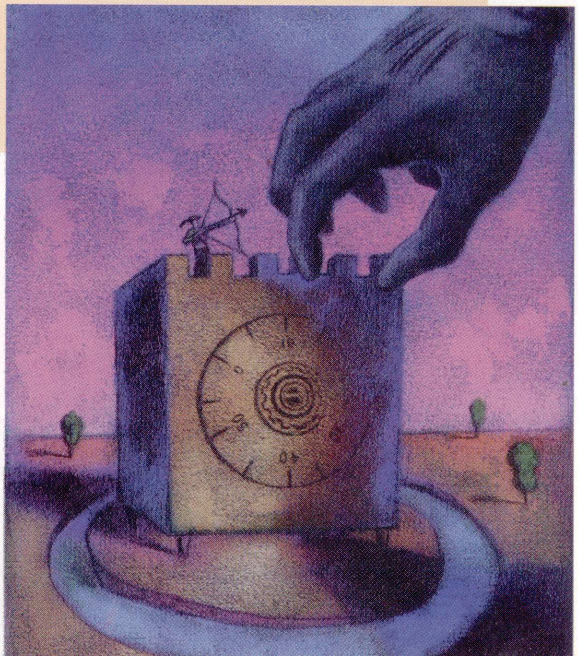
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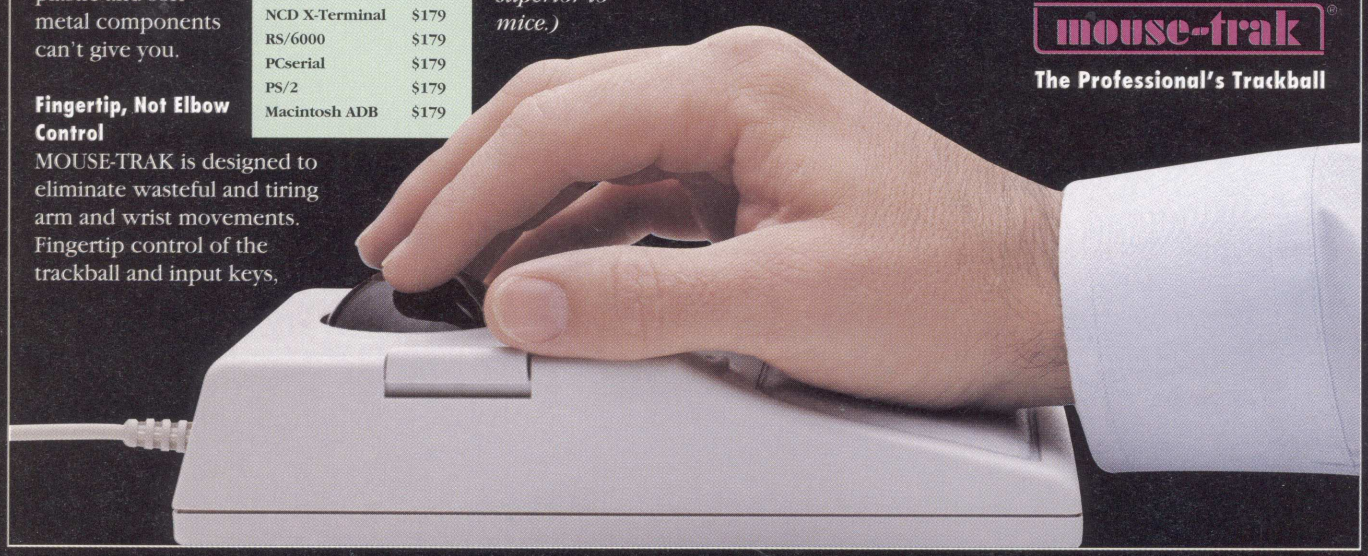
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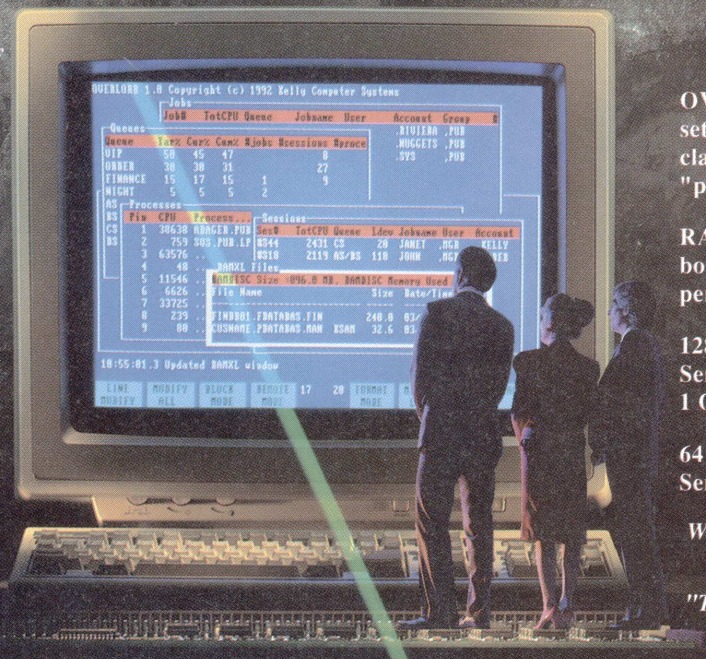
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**CIRCLE 09 ON READER CARD**



hp-ux/usr

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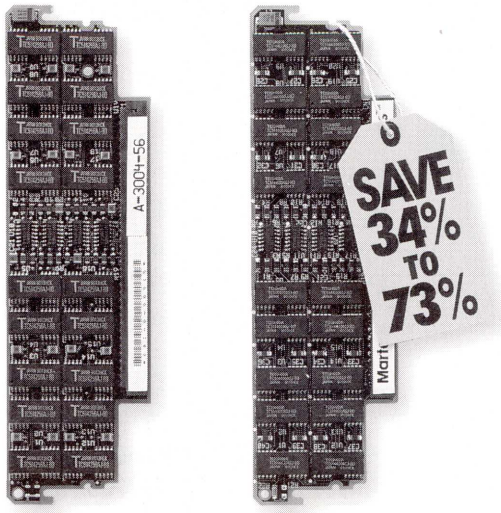
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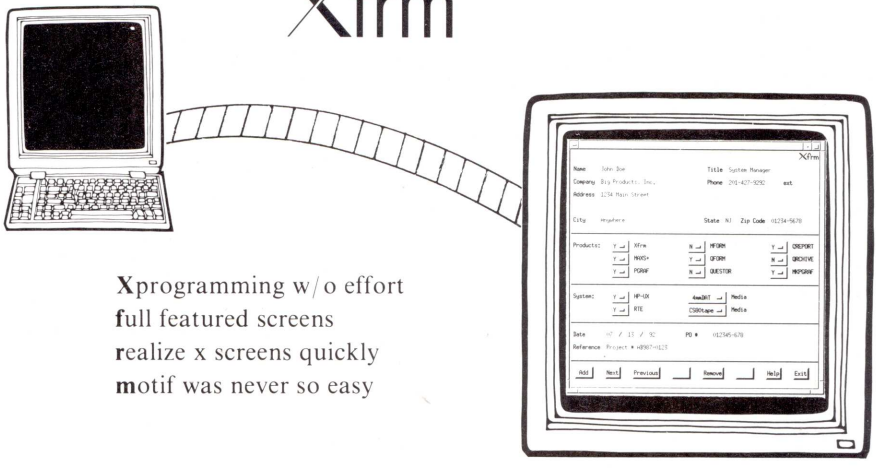
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# the editor

## letter from

WELCOME TO THE premier issue of *hp-ux/usr*, the INTEREX publication for HP-UX users. Why yet another UNIX magazine? you will ask. Although the INTEREX Board of Directors and the Publications Department must consider many issues when a new magazine is launched, two main reasons underlie the creation of *hp-ux/usr*.

For the last two years *Interact* magazine has carried articles on both MPE and HP-UX. The mix has varied from month to month, but reader surveys and feedback from members have indicated a strong desire to see separate publications for the operating systems. Users in 3000 shops don't want to plough through the HP-UX material and HP-UX readers have little use for the MPE articles.

The second impetus for launching *hp-ux/usr* is the sheer growth of HP-UX. Hewlett-Packard is continually expanding and upgrading its HP-UX products. The company is moving aggressively to widen its role in the "business UNIX" market; at the same time, sales of 9000 workstations in technical and manufacturing markets continue to increase. INTEREX reflects this growing HP-UX constituency: membership in the HP-UX category is up almost 50 percent over last year. The INTEREX board and staff felt that a new, HP-UX-specific magazine best served the burgeoning HP-UX membership and marketplace.

*hp-ux/usr* is the only magazine dedicated exclusively to the HP-UX user. Its raison d'être is to provide hands-on solutions to readers' day-to-day hardware, software, and operating system concerns. The publication examines big-picture issues such as systems integration, networks, and distributed computing, and takes a close-up look at solutions to specific problems. *hp-ux/usr* provides readers with a level of detail sufficient to make the material useful on the job.

The magazine serves readers at all levels of expertise, from the novice floundering in a sea of complicated commands and arcane procedures, to the systems administrator grappling with a huge network embracing hundreds of users. Our writers are experienced HP-UX users, and technical experts from Hewlett-Packard. The overriding criterion for selecting articles is their excellence in both content and presentation.

As a practical matter, HP-UX-specific columns in *Interact* move to *hp-ux/usr* with this opening issue. New products specifically for the UNIX/HP-UX markets will be featured in *hp-ux/usr* and will not run in *Interact*. *hp-ux/usr* is planned as a bimonthly, 48 to 64-page magazine. Three fine articles and a full complement of columns have pushed this first issue to nearly twice the normal length!

I want to hear from you. Let me have your comments and suggestions about *hp-ux/usr*. Do you have a question?—Send it in for Q&A. Do you have a hot tip?—Write it down and submit it to Users' Forum. Do you wish to write an article or a review?—Call me to discuss it. *hp-ux/usr* is for users, and its success depends, in large part, on the participation of its readers.

*Michael Ehrhardt, Editor, hp-ux/usr*
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NEWS

hp-UX

# SigUNIX Meeting Notes

## New Orleans 1992 INTEREX Conference

SigUNIX met on Wednesday, August 26th, 1992 following a full day of UNIX-related papers and presentations at the annual INTEREX North American Conference. A small but enthusiastic group of 29 individuals attended.

The first order of business was the election of officers to serve until the 1993 Annual Convention. Elected chairman for a fourth term was R. Arthur Gentry of Gentry and Associates. Denny Allain of E Systems was elected vice chairman, and John Rasins of Graham and James, Secretary. Congratulations to all the new and returning officers!

Next was a brief report from the chairman on activities directly involving the group during the past year. It was reported that due to restructuring within INTEREX, SigUNIX no longer had control of SIC/HP-UX, CSL/HP-UX or the UNIX portion of the annual conference. Also, due to new SIG rules, this is the last year that the current chairman will be allowed to serve in that capacity. The new chairman will be appointed by the SIG Steering Committee rather than being elected by the membership.

Efforts relating to the establishment of comp.org.interex on the internet were reported and discussion revolved around soliciting assistance in getting future attempts passed by the usenet community. Another attempt at establishment will be made this spring. All INTEREX members are encouraged to support the vote for comp.org.interex when it is presented to the net. The chairman reported that the last attempt did not fail because of negative response, but rather because of lack of response to the vote request. Per net rules, a minimum of 100 individuals must respond to the call for votes for the vote to be considered valid; a simple majority is all that is required for group establishment. The members present all agreed that this would be a good vehicle for keeping members apprised of activities in a timely manner.

Also discussed was the creation of at least a dotted-line relationship with InterWorks, the HP Workstation Users Group, as those members are also heavy users of HP-UX and Domain. The chairman committed to investigating a possible working relationship with the group to share ideas and information.

Next was a report from Paul Gerwitz, the CSL/HP-UX Chairman. He reported on the number of contributions in the library to date, the significant help we have received from HP Labs, and the creation of an M.O. disk that has all of the releases of the CSL/HP-UX on it. Details of that report can be found elsewhere in this magazine in the CSL Department. Thanks for all your hard work Paul!

Jim Sadler reported on recent activities of the SIC/HP-UX, including a recent survey of concerns and enhancement requests. Results of that survey can be found in previous issue of *InterexPRESS*. SigUNIX also extends its heartfelt thanks to Jim for the work he has done on behalf of the group.

*R. Arthur Gentry, Chairman, SigUNIX*

# Your Problem:

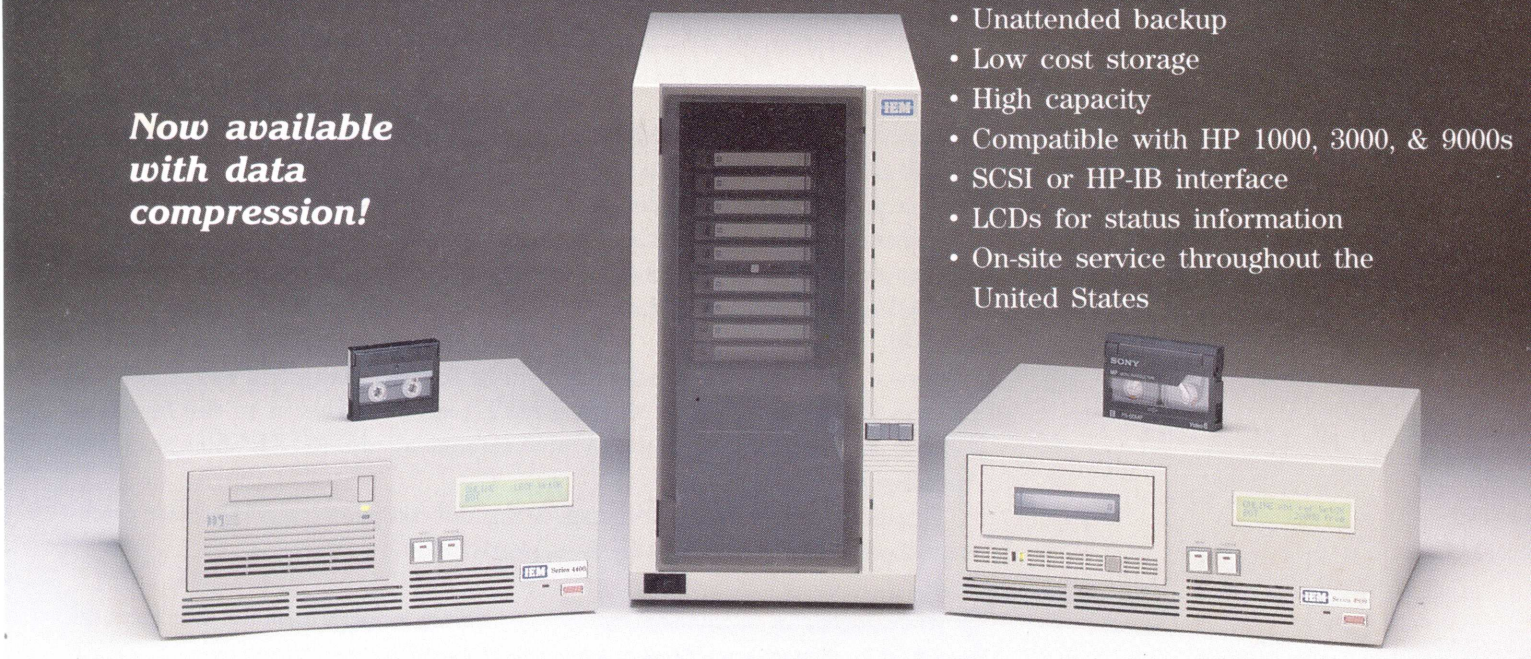


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question and answer

**Q: I have several patches (about 20) that I need to install and they are all in the /tmp directory as *.updt files. Is there some automatic way to update everything?**

**A:** The method is to load all the patches onto your system using updist, and then run update to select all the patches you want. This avoids having to reboot multiple times since update will perform all the required tasks (updating libraries, files, etc.) and then reboot at the end of all the tasks.

A Network Server may be used to update itself with patches. First read the instructions in the *Installing and Updating HP-UX* manual on "Setting Up a Network Server to Update HP-UX."

Now run updist in a loop to load all the patches into the netdist directory (/netdist by default).

Also, it is possible to do all of the 'updist's at once if you use a find command with the -exec option or a shell loop to run updist in non-interactive mode.

For example, mkdir /netdist

```
for files in *.updt
do
     updist -s `pwd`/$file '*'
done
```

Note that the `pwd` is there, since the full path to the file is necessary; otherwise, updist will consider the file to be a remote server name.

Once you have run /etc/updist on all the desired patches, you can now run update once, changing "Source or Destination" to "From Netdist Server to Local System …". Next enter the local system name in the "Netdist Server (source):"; then highlight "Select/View Partitions and Filesets …" and select the desired patches and run update normally.

Once update has completed, regen will be run and the system will be rebooted. You should then move all the PHKL_ xxx.text files in to the /system/PHKL_xxxx directories. You may now remove all the PHKL* files from the /tmp/directory.

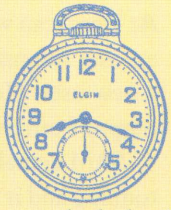
This technique also has an advantage in that this computer can now provide patches to all other similar machines on the network.

**Q: When bootup (or /etc/dmesg) reports real memory, lockable mem and avail mem, occasionally avail mem goes close to zero. This is usually caused by having nproc set extremely high, such as nproc=9000.**

**A:** When configuring large systems, you might occasionally scale-up system parameters to unusable extremes, in the case that system resources come into high demand. The unfortunate side-effect of this is that doing so increases the kernel's use of memory for unneeded tasks, preventing the use of kernel memory for other, necessary tasks.

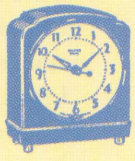
One example of this is a situation in which the system will not allow any process to lock memory, because it has reserved too much space for non-lockable memory. This can be seen at boot time, with the messages:

# NBSPOOL FOR UNIX... IT'S ABOUT TIME



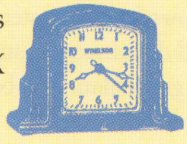
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**CIRCLE 02 ON READER CARD**

```
real mem = RRRR
lockable mem = LLLL
avail mem = AAAA
```

- "rel mem" is the total amount of physical memory in use by the system. Unless you have imposed hardware restrictions on system memory, this should be all of the memory installed. The number is in bytes.
- "lockable mem" is the amount of memory which the system will allow processes (including the kernel) to "lock". When a process attempts to lock memory (see plock(2)), it is requesting that the OS keep this physical memory associated only with this process.

This is to keep a critical process from having to give up its physical memory and then wait for the VM system to page or swap in pages when they are needed. As a rule, you do not want all of your memory to be lockable, because this could defeat the VM system — if processes locked most of memory, then other processes would not have any memory to run.

- "avail mem" is the amount of memory available for user processes to use. This is the difference between "rel mem" and the amount used by the kernel itself.

In this message, if "lockable mem = 0", this means that the system has reserved all memory as un-lockable, and that if a process wishes to lock some of its memory, the locking request will be denied. There are two ways to arrive at this situation.

1- Setting the "unlockable_mem" parameter too high in the gen file. Note that this value is specified in pages, so multiply by 2k or 4k, depending on your machine, to find how much you are specifying. (See *System Admin Tasks*, appendix A)

2- Using the default of "unlockable_mem" as 0 (or less), and setting nproc (number of processes allowed on the system) very high.

This second scenario is not well documented, and will result in the system making the following calculation at boot time:

```
unlockable_mem = 100 + (UPAGES/2) * nproc;
```

The system is trying to figure out how much memory would be required to keep half of the process-management areas (u_areas) in memory at all times, when all of nproc processes are in use.

In 8.0, with 2k pages, UPAGES/2 is 2, so that's "100 + 2 * nproc" pages of unlockable_mem. If an unknowing user sets nproc to 10k, unlockable_mem will be set to 100+20k, or roughly 40MB. On a system with 48 MB of physical memory, this will allow little, if any, memory to be lockable.

The moral of all this is that if you have a system with processes failing because there is no memory to lock, and unlockable_mem is set to 0, then you should check to see that nproc is something reasonable.

**Q: How do I view results of customized SAM scripts?**

**A:** Users can write their own customization scripts for SAM to execute automatically before or after certain tasks such as adding a new user. However, when SAM runs the script, there is no output from the script shown to the user.

SAM actually saves this output into a file called: /tmp/custom.log and it will contain the text from SAM's acitivity as well as any output from the user's script. It is overlaid by each run of SAM, rather than being appended.

**Q: Changing a remote printer to JetDirect does not work.**

**A:** The install script is smart enough to recognize that an existing printer is being changed to JetDirect. However, the script simply adds the JetDirect model to the /usr/spool/lp/interface directory and moves the existing model script to the subdirectory:

```
/usr/spool/lp/interface/model.orig
```

with the same name as the printer. If the printer was previously a local printer (i.e., RS-232 or parallel), then the conversion will go without a problem. However, a remote printer, located on another host system, will have a special model script in the interface directory and the resultant conversion will not work.

Here is a diagram of how the JetDirect scripts work (the printer is named jet1)

```
/usr/spool/lp/interface/jet1    (JetDirect-specific script)
/usr/spool/lp/interface/model.orig/jet1
                              (a model script called by
                    the jet1 script in the parent directory)
```

To fix the problem, use lpadmin (-x option) to remove the remote printer completely. If the JetDirect conversion has already been done, remove the file stored in /usr/spool/lp/interface/model.orig, which has the same name as the remote printer. Verify that the remote printer has been removed with lpstat -v.

Now add the JetDirect printer/plotter using /usr/lib/hpnp/hpnpcfg and choose the Add peripheral to spooler option. The above problem does not affect BOOTP configuration.

# HP-UX UNIX CLIENT/ SERVER

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CIRCLE 08 ON READER CARD

**Q: After installing the JetDirect card in my printer, the error message 43 OPT INTERFACE is displayed and I cannot print to the printer.**

**A:** The JetDirect card (models C2071S and C2071T) does not have permament storage of its configuration and requires a BOOTP server to download the IP address, subnet mask, and other configuration data. If the LAN cable is disconnected while powering up the printer, or the BOOTP server is offline or not configured, the 43 error will be displayed.

To verify the problem, you can press Continue on the front panel of the LaserJet and the printer will go online, displaying READY. By pressing the STATUS button on the JetDirect card (in the back), a status sheet will be printed, and if the IP address is still 0.0.0.0, then the card has not been loaded by the BOOTP server.

Refer to the *JetDirect Administrator's Guide* (p/n C2850-90001), chapter 2, for setting up and verifying a BOOTP server.

**Q: How do I browse man pages in HP-UX?**

**A:** It would be nice to browse through man pages using a facility like vi to locate keywords and jump back and forth. The following script will do this:

```
#! /bin/sh
TMP=/usr/tmp/.myman$$
rm -rf $TMP
man $1 | col -b | unexpand -a > $TMP
if [ -s $TMP ]
then
     vi $TMP
fi
rm -rf $TMP
```

Save this script in /usr/local/bin or /usr/contrib/bin as appropriate and change the permission to 755 so everyone can access the script. To read a man page with vi, type:

```
viman fsck
```

for example, and the fsck man page will be passed to the vi editor.

**Q: Can I use a non-lp spooler with the new LaserROM program?**

**A:** Beginning with the new LaserROM-II program called lrom (version B.00.00), the list of printers is easily customized for applications such as OpenSpool as well as non-HP spooling systems.

Normally, lrom will call the command lpstat -v for a list of printers in the current system. This list is processed through a simple script that extracts just the name of the printer. To make this task easily customizable, a script called /usr/lrom/prnlist.gen is provided for the system administrator to modify according to local needs. The script contains the line:

```
lpstat -v | awk -F: '{ print $1 }' | awk '{ print $3 }'
```

which produces 1-line output of just the printer names. For example, if lpstat -v produces:

```
device for hp2564b: /dev/lp0
device for lj2k_a: /dev/null
device for lj2_c: /dev/null
device for lj_e: /dev/null
device for lj_k: /dev/null
```

then the script produces:

```
hp2564b
lj2k_a
lj2_c
lj_e
lj_k
```

For non-standard spoolers such as OpenSpool or non-HP-UX spooling systems, change the script prnlist.gen. This script must be readable by lrom in the current environment. If it is missing or unreadable, lrom will use a built-in copy of the default script, which is stored in the program.

The script is read-only at the beginning of the lrom program so changes to the script will take effect after lrom is stopped and then restarted.

---

*Bill Hassell, HP-UX System Support at the HP Response Center in Atlanta, Georgia, supplies hp-ux/usr with the Center's "most often asked" questions.*

### 9000 Workstation

**Q: I currently have a ScanJet IIC for my PC. Can I use it on my HP 9000 Series 700, Model 750 ?**

**A:** There will be a SCSI 2 upgrade path for existing PC-based scanners that would like to move to a Series 700 HP-UX workstation. This upgrade will be made available for all customers

and dealers using or supporting a ScanJet IIC on a PC. A one-time charge to the customer will ensure a rapid one-day turnaround with a retro-fitted SCSI II scanner unit.

To upgrade your SCSI I compatible scanner call: Hewlett-Packard Corvallis Telemarketing, (503)750-3105.

You will receive an upgrade price quote and instructions over the phone. DeskScan-UX is an HP-UX software product that will enable the HP ScanJet IIc desktop color scanner on configured Series 700 workstation platforms.

DeskScan-UX supports TIFF, JFIF, GIF, XBM, XPM, XWD, and BMF file types. Printing is supported on PCL devices in PCL3+ and PCL5 formats, using the HP SharedPrint (Hardcopy) product.

DeskScan-UX is supported on HP-UX IF3 8.07 OS or later versions. X Window System (Version 11 Release 4) includes MOTIF V1.1, included with HP-UX 8.07 or greater.

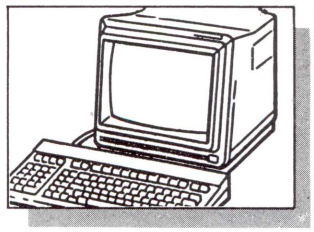
You can either purchase the scanner bundle (which includes a ScanJet IIc), product number C1788A or the Interface Kit only (excludes ScanJet IIc), product number A2229A ◧

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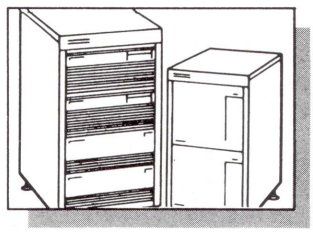
*Kaushik Mehta of the Hewlett-Packard Response Center in Atlanta, Georgia, answers workstation questions.*


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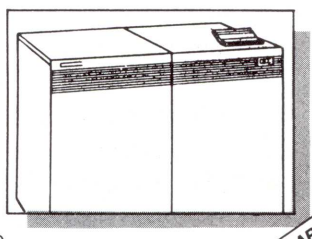


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**CIRCLE 18 ON READER CARD**



# INTEREX on InterNet

INTEREX has established connections to InterNet, allowing for fast and easy E-mail exchange between INTEREX and its membership. In addition, INTEREX is carrying the complete "comp" news hierarchy of NewsNet and will be posting items of interest to Hewlett-Packard computer users in "comp.sys.hp".
To send mail to INTEREX, use one of the following formats. Please check with your local system administrator to see which is valid for your particular site:

***(name)%interex%daver.uucp@uunet.uu.net***
***example = sullivan%interex%daver.uucp@uunet.uu.net.***

The following IDs are currently active on INTEREX's HP 9000:

| ID | DEPARTMENT | NAME |
|---|---|---|
| postmaster | InterNet support | John Sullivan |
| cslhpux | CSL/HP-UX support | Paul Gerwitz |
| clsmpe | CSL/MPE support | John Sullivan |
| membership | Membership Services | Ruby Turner/ Johanna Seele |
| finance | Finance | Ron Padilla |
| pubs | Publications | Dick Rasmusson |
| gerwitz | CSL/HP-UX contributions | Paul Gerwitz |
| conference | Conference arrangements | Kathy Herzog |

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# File System Cleanup

*by*
*Chris Curtin*

HELLO AND WELCOME to the new HP-UX specific publication and the Systems Administration Column. My name is Chris Curtin and I am a Senior Software Engineer for Bradley Ward Systems, Inc. in Atlanta, Georgia. I am also the Systems Administrator for the company.

I have written the HP-UX Systems Administration column for *Interact* for the past year and a half, and I am excited about having a more focused audience on HP-UX instead of being often the ONLY HP-UX specific piece in the magazine.

I have been the "official" Systems Administrator at BWI for about four months. Unofficially I had been performing the job for almost two years. I administer a LAN consisting of an HP 9000/827, currently running HP-UX 8.02; an HP 9000/835, currently running HP-UX 7.00; an HP 9000/720 running HP-UX 8.07; ten 700 R/X X terminals and a couple of PCs and a Macintosh.

Unfortunately I do not have access to any 300 or 400 systems. All of my columns will be about HP-UX in general and should also apply to the 300 and 400 systems. I clearly mark anything that is hardware specific.

As a company, BWI develops process supervisory and control software for factory automation and statistical weight control on HP-UX. We make extensive use of the X Windowing System, the HP-UX "real-time" priorities, C and C++ compilers and networking features. Our constant stressing of HP-UX allows me to detect problems, suggest performance improvements and use new features daily. Anything that I learn I pass on to you through this column.

I would also like feedback from you, the reader, on this column. As systems administrator, once things settle down and start to work correctly, there is very little that you must do to keep the system running day to day. Daily backups and simple maintenance are all that is needed. My systems now are fairly stable so I have very little to do as systems administrator (as a software engineer, that is a different story!). What I would like from you is ideas for future columns and feedback on my writing: Are the columns too basic? too complex? are they boring? I would like to know so that I can better address your needs and hopefully learn something new myself.

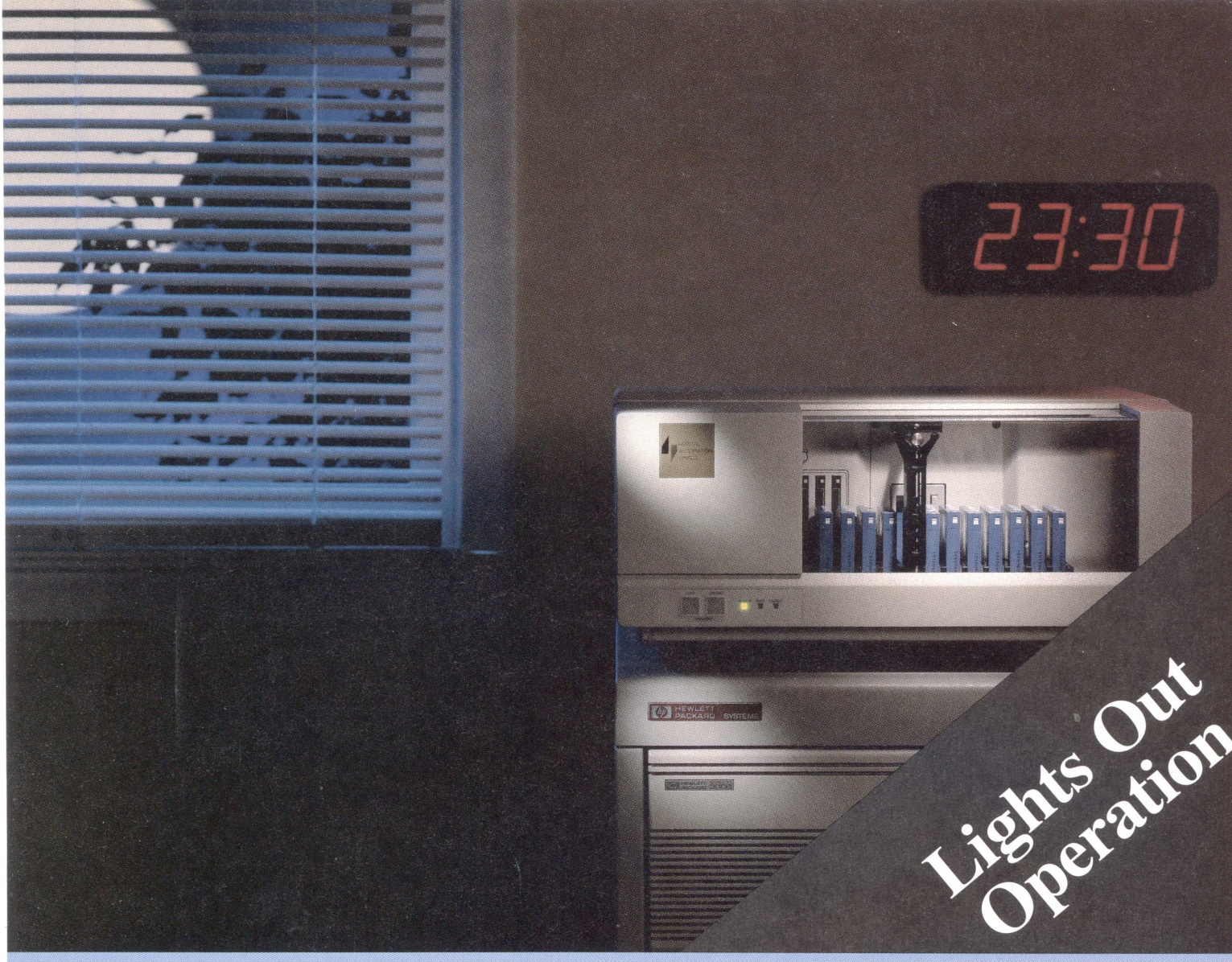
Here are some ideas that I have for topics over the next few months:

**1.** Installing HP-UX 9.0 on a bare system.
**2.** Upgrading to HP-UX 9.0 from 8.0 and 7.0.
**3.** An overview of HP-UX 9.0 from a systems administrator's point of view.
**4.** Logical Volume Manager (LVM)
**5.** The new Systems Administration Manager (SAM).
**6.** Glance for HP-UX 9.0
**7.** The new NFS release supported in HP-UX 9.0
**8.** Administering the X Window System Releases 4 and 5.
**9.** HP's new support tools: XSTM and CSTM.
**10.** Obtaining information about HP-UX patches.
**11.** Publicly available HP-UX systems administration tools.

The HP-UX 9.0 specific columns will be written when I have updated or installed our systems. I may also combine several topics into one column.

For the rest of this month's column I will suggest ways of getting control of your HP-UX system's disk space.

There are several HP-UX programs and daemons that create log files that can grow without bounds. These are the first area that you want to tackle. Many of these files are useful for problem diag-




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CIRCLE 04 ON READER CARD

nostics or testing a new configuration but are not necessary for everyday use. These include:

```
/usr/spool/lp/log              Information about every print job
/usr/spool/lp/lpd.log          Information about the lpd daemon
/usr/spool/uucp/.Log/uucico/*  Information about UUCP transfers
/usr/spool/uucp/.Log/uux/*     Information about UUCP actions
/usr/spool/uucp/.Log/uuxqt/*   Information about UUCP commands
/usr/spool/mqueue/syslog       Information about all mail messages
```

Many of these files are cleared when the system is rebooted, but if your system is not rebooted often you may want to trim them.

Every time a user logs in to the system, a record is created in the /etc directory in three files: /etc/wtmp, /etc/btmp, and /etc/utmp. This information is used by the accounting system, the who and w commands and the finger command. This information is useful for the last few logins by a user, but not the last one hundred! Trimming these files regularly will save some disk space.

Now, how do you clean up all these files? I recommend a two-pronged attack: When the system is booted, and monthly. When HP-UX boots it executes a file called /etc/rc. This file starts many of the HP-UX subsystems and daemons. There is a subroutine in the file named 'localrc()' where you can add system specific commands to run when the system is booted. I have a script that is executed in this file. It cleans out the /etc/*tmp files, the mail and lp spooler files, and the UUCP files. The other way used is a monthly cron job that calls the same script at 3 or 4 in the morning.

The /etc files must be cleaned up using: cat /dev/null > /etc/<name>. Blindly removing the /etc files is not a good idea!

You should also look through the /usr/spool directory for any large files that have 'log' in their name. These are log files created by different processes that may be specific to your system.

Once you have cleaned out the log files, you should look for core files. Core files are images of processes created when they receive a fatal signal. These are often large and also are forgotten about. Cleaning up core files is easy:

1. Change directory to the root (/) directory.
2. Execute `find / -name "core" -mtime +3 -exec rm -rf {}\;`

The second step tells the find command to find all files named core that are more than three days old. The time period is important because your developers would not want you to remove a core file that they were using! I have this command in a script that I run every night at 1 a.m.

Before you start removing core files automatically at night, send a message to all your users that you will be doing this. If your developers know that you are going to be deleting the core


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**HP-UX CSL Release Update**

The '93 HP-UX CSL release is scheduled to be shipped in late April. The release contains utilities and applications that have been created by HP-UX veterans to target specific challenges HP-UX users face. The programs are tested, debugged and fully documented. The '93 release will feature:

- **imake 4.0,** a make facility for windows
- **xgrab,** a capture program for Windows graphics
- **X11R5,** latest fix files for X11R5 (for X window systems)
- **f2c,** a FORTRAN to C converter

The '93 release will ship automatically to all INTEREX HP-UX CSL level members; additional releases are available for purchase to CSL level members for $400 in any of the following formats: 1600 BPI magnetic tape, 6250 BPI magnetic tape, Linus cartridge tape (CS-80) or DAT 4mm.

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files every night, they can rename them if they want to save them.

The next area to check is the /dev file system. Often large files are placed here when a user tries to create a file on a device that does not exist. For example: The DAT drive on our 827 is /dev/rmt/0m. I have found files in /dev named '/dev/rmt/om.' HP-UX does not complain if the file that you are using for a tape device does not exist. Rather, it will create the file as a normal file, instead of using a special device file!

To check if there are any such files, execute:

```
find /dev -type f -exec ll {} \;
```

This command will find any files that are normal files (the -type parameter) and give a long listing of the file. If the command shows any files, remove them.

Now look in the lost+found directories for each file system. If there are any files in these directories, try to determine what they are. If you cannot, delete them. If someone was missing them, they would have complained before now.

Finally clean up the /usr/tmp and /tmp directories. Set a rule that any file left in this directory for more than three days will be deleted. This way your users will not be surprised when files start disappearing and it will teach them to clean up after themselves!

To clean out these directories use:

```
find /tmp /usr/tmp -mtime +3 -exec rm -rf {}\;
```

This is just like the command to remove the core files I used above. Now that you have cleaned up the files that you have control over, ask your users to do the same. Check the size of their mail boxes in /usr/mail. If they are greater than one megabyte, then ask them to clean them out. Also have them look for blind carbon copies of their mail. Most mailers allow you to specify that a copy of any mail that you send out be saved in a local directory. Have them clean those out also.

These steps should help you keep tabs on how much disk space you really need on your system and keep the HP-UX log files from growing out of control.

I am looking forward to hearing from you about ideas and suggestions for this column and on this publication too! ◧

---

*Chris Curtin, a software developer for Bradley Ward Systems, Inc. in Atlanta, Georgia, specializes in device driver development for factory automation on the HP 9000. He can be reached via e-mail at: gatech!wittsend!bwilab3!chris*


# Share Your Expertise

*Submit an article to hp•ux/usr*

*hp-ux/usr* editor, Michael Ehrhardt, is looking for well written user-submitted articles that address the real problems of both the new HP-UX user and the experienced administrator. The overriding criterion for selecting articles is their excellence in both content and presentation.

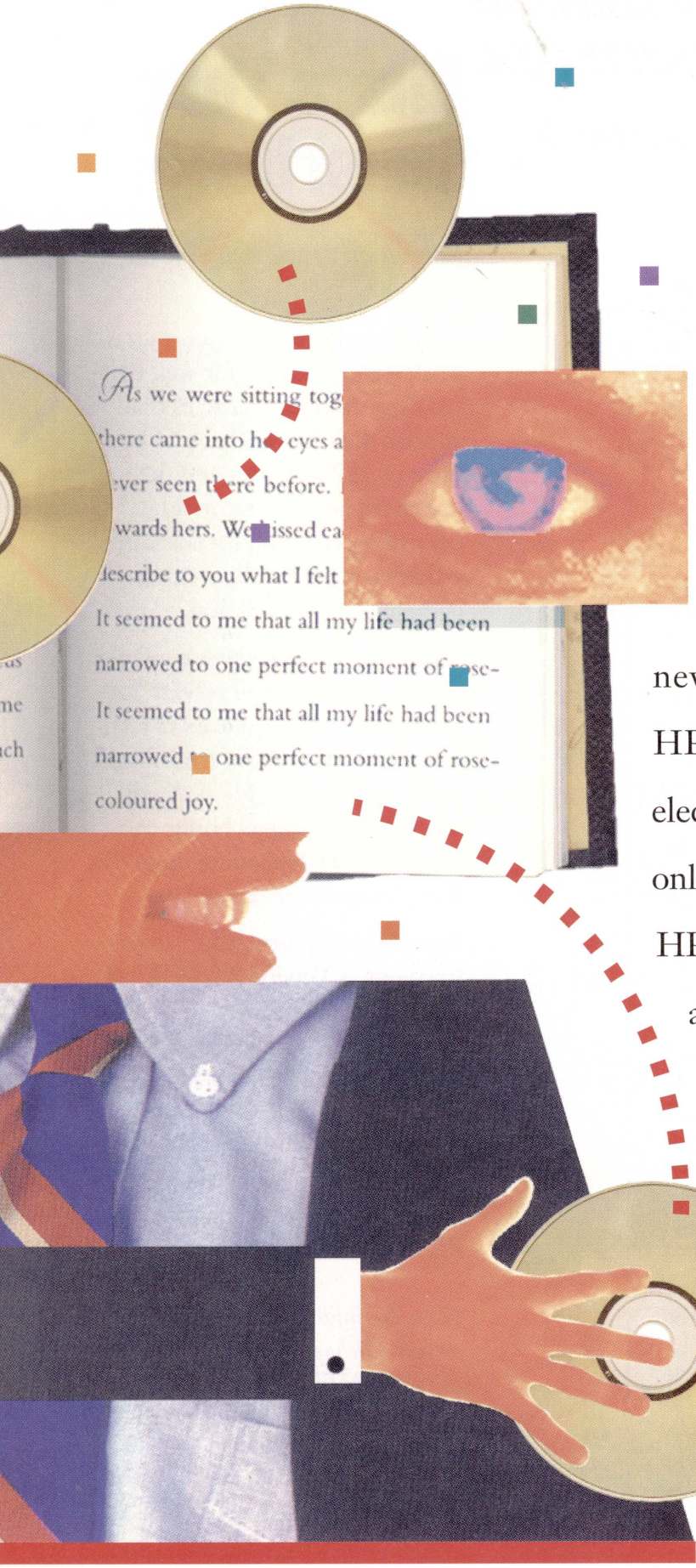
Authors of articles chosen to appear in *hp-ux/usr* will receive $50 per typeset page. Authors of articles that review hardware and software pertaining to HP-UX will receive an additional bonus of $300 to $800 depending upon the complexity of the review.

The preferred format for submitting copy is Version 2.0 of Word for Windows, followed in order of preference by Microsoft Word, Word for the Mac or pure ASCII text. Copy should be sent via InterNet E-Mail or on Floppy disks. Any graphics or figures should be submitted on disk in PICT or PCX format.

*For more information, contact Michael Ehrhardt at (800) INTEREX.*

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# La

WITH THE INTRODUCTION of the newest version of HP LaserROM/UX, HP has established a new standard for electronic documentation. Although many online documentation systems exist today, HP's LaserROM/UX effectively uses the analogy of a book with tools not unlike the methods used to browse through paper manuals. Leadership in electronic documentation enables the HP-UX user to quickly search through dozens of manuals and be confident that the documentation is updated every month via CD-ROM.

ILLUSTRATION BY GORDON STUDER

# A New Look for LaserROM/UX

*by Bill Hassell*

serROM

Not unnoticed by the computer community was the possibility to use the compact disc as a media for computer data storage. Despite a multitude of critics, the read-only nature of the CD survived the audio test and now it has become a new way to think about data distribution. After all, computers have traditionally used only write/read media. Or is that true? Remember paper tapes and punched cards? These write-once, read-many artifacts were for many computer buffs the only method to communicate with computers during the early days of computing. In this regard, the CD is no different except that the magnitude of data contained on that little five-inch disc is now over 600 megabytes.

Storing the data involves a process not unlike pressing phonograph records (remember them?) where a master is created and each disc is manufactured by pressing the data bits into a thin metal coating. The computer CD is called a CD-ROM for short and is read using equipment similar to their audio counterparts. As with the audio disc, large portions of the data are devoted to error detection and correction. The data tracks are so small that the slightest amount of dust and/or finger prints will cause errors when reading the bits from the disc.

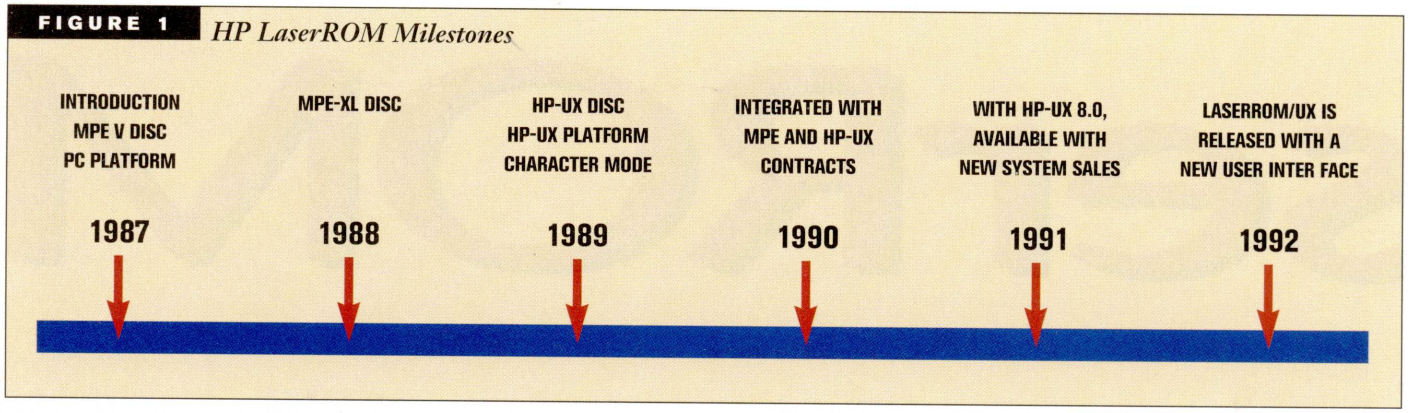
Compact Discs use a sophisticated method to handle error conditions, including elaborate checksums as well as error correction bits. Yes, errors in the data stream can actually be corrected by using additional data stored on the disc. For audio discs, this means that the music flows non-stop without an error. Even when the audio disc has an unrecoverable error, additional circuits in the player will create 'fill-in' sound by duplicating a previous moment of the music. Only the worst errors will cause the audio disc to lose track and reset itself.

As with the audio disc, large portions of the data are devoted to error detection and correction.

Inherent with the advent of distributed computing are the problems associated with documentation, its price and availability. Many computer centers will have several workstations on a network and this lends itself well to a centralized documentation strategy. Within the HP-UX community, online documentation often takes the form of the man page which users can access from a standard operating system installation. However, a fully formatted set of man pages can occupy more than 15 megabytes of disk and many system administrators will either delete the entire man page directory structure, or at least remove all the formatted page directories in order to reduce the storage requirements.

For a bit of history, look at figure 1 (next page) to see how the original product was developed for the HP 3000 documentation requirements, then ported to the HP 9000. The original design for HP LaserROM was based on the PC, using MS Windows as the environment. With the HP 9000, both a graphics window version as well as a character version

**FIGURE 1** *HP LaserROM Milestones*




were designed, offering great flexibility within the multi-user environment of HP-UX.

Extensively researched and tested prior to introduction, the latest version of LaserROM has many of the most-wanted features voiced over the last several years including multiple pages opened at the same time, bookmarks or margin notes, and unlimited database searches.

Much of the credit for the design goes to the early work done in HP's human factors laboratories, where preliminary versions of the program's appearance and base functionality could be evaluated and fine tuned before program coding was begun.

Within HP, HP LaserROM/UX has fostered the growth of a standard mark-up language such that paper or electronic documentation may be prepared from the same source documents. In this way, most of the conversion process can be automated, thereby virtually eliminating possible differences between the paper copy and the CD-ROM version. This is no small feat in that HP LaserROM/UX must use a fixed font for display, primarily for character-based terminals and for printing, while the source documents ultimately use proportionally spaced fonts for good appearance in printed form. If the text were simple text, there would be no problems; however, many documents contain reference tables which when expanded, produce line widths over 100 characters long.

To keep tables in relative alignment, the tables must be formatted by the markup language using built-in intelligence for table formatting. In this case, an item in a box might require only one line when printed with proportionally spaced fonts, while the same item will need three lines in a fixed font. The formatter then adjusts the size of all the boxes on a given entry to match the longest box.

Pictures are worth a thousand words and in CD-ROMs, this is often quite literally true. A large half-page picture is stored as a series of dots at HP LaserJet resolutions of 300 dots per inch. Thus, a picture 5 by 7 inches in size will require almost 400,000 bytes of data to store the picture. Even with more than 600 megabytes of storage available, the CD-ROM may overflow with graphic images. Typically, the text for a LaserROM documentation disc occupies less than 10 percent of the available data space while graphics images fill the rest.

Starting in June of 92, HP began shipping the newest version of LaserROM for the HP 9000 series of computers. This version, based on Motif windowing standards and using the X11/R5 libraries, not only provides a new look and feel for LaserROM/UX, it functions very much like the books it was meant to replace. In addition, LaserROM/UX reads compressed graphics files thus allowing even more data to be stored on the discs.

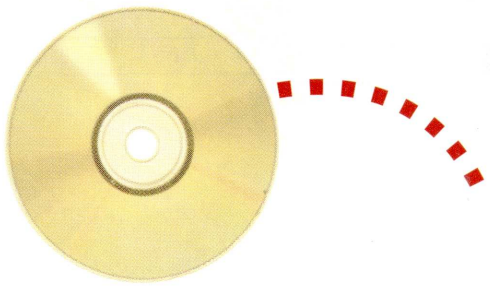
### CDROM Drive Installation

Installing LaserROM/UX is quite simple and involves setting up the host computer to allow CD-ROM disc drives to be attached. Here is a summary of the steps for HP-UX beginning with the adding of a CD-ROM drive to the computer:

### HP 9000 Series 300 Computers

First, verify that cdfs has been added to your kernel. Use SAM to perform this task by selecting the Kernel Configuration -> menu item and then Add/Remove Subsystems ..., which will then display the state of various subsystems including cdfs (shown as CD-ROM/9000). If not present, cdfs can be added with SAM or you can edit the file /etc/conf/dfile.

Run the editor on /etc/conf/dfile and verify that the appropriate interface drivers are present: either cs80 (for



HP-IB) or scsi for SCSI). Also verify that the appropriate interface has been added to dfile (98624 for the internal HP-IB interface, 98625 for the external HP-IB interface or 98265 for the SCSI Interface).

The Model 600/A CD-ROM drive is a CS80 disk device and must use the cs80 driver. The internal CD-ROM drive optionally found on many Series 400 computers is SCSI, as is the external drive, the A1999A CD-ROM drive. Also, the CD-ROM discs use a different file system called 'cdfs', which handles the unique read-only characteristics of the CD-ROM discs.

Be sure that the computer is properly shut down and powered off before attaching any cables or new devices. For SCSI, be sure that the proper SCSI terminator is used on the last device in the chain.

Set the address of the CD-ROM drive before powering up the computer and drives. For the HP-IB drive, simply rotate the address dial on the back to an unused address on the HP-IB chain. For the built-in SCSI CD-ROM drive or the external CD-ROM drive, refer to the installation manual for information on the jumpers or switches.

After rebooting, cd to the directory /etc/conf and regenerate the kernel by typing:

```
config dfile
```

After successful completion of the config command, type:

```
make -f con g.mk
```

Verify that the make command has created the file hp-ux. Then, be sure that you are logged in as root on the system console, and that all users on the system have logged off. Move the kernels to their new locations by typing:

```
cp /hp-ux /SYSBCKUP
mv  hp-ux /hp-ux
```

finally, reboot the new kernel by typing:

```
/etc/reboot
```

If there are problems with the new kernel, use the shutdown command,

```
/etc/shutdown -h 0
```

to cycle power on the CPU, and then press any key after the word 'Keyboard' is displayed on the screen (attended-mode boot). Then wait for a list of the known operating systems to appear in the upper right corner of the screen and choose SYSBCKUP, which is typically 2H.

Once the new system has been booted successfully, log in as the root user and make the device files for the CD-ROM drive. They will appear the same as any disk device so the rules are the same.

For the HP-IB version of the CD-ROM drive:

The HP-IB drive can be on either high-speed or low-speed HP-IB bus connections. Although the drive is somewhat slower than most CS80 disks, tests indicate that there is no noticeable performance change when connected to the same HP-IB cable as the main system disk(s).

As with all HP-IB disks, if the CD-ROM player is on the same bus as a 9144, 9145 CTD, or the autochanger for CTD's, the use of the CTD at the same time as CD-ROM access can delay the data for several seconds.

Now, make the special files using the mknod command:

```
mknod /dev/dsk/CD-ROM1  b 0 0xssaa00
mknod /dev/rdsk/CD-ROM1 c 4 0xssaa00
```

where: CD-ROM1 is any meaningful name for the CD-ROM drive; for example, the name CD-ROM1 could be used for a CD-ROM at HP-IB address 1. The major number is 0 for the block device and 4 for the character, or raw device.

0xssaa00 is the HP-IB selectcode and address for the CD-ROM. 'ss' is the selectcode, for which 07 is typically the low-speed card and 0e is the internal high-speed HP-IB selectcode. The 'aa' digits refer to the HP-IB address set on the back of the CD-ROM player. Since all disk devices are limited to an HP-IB address of 00 to 07, this will be the range for the CD-ROM player.

For example, to set up the CD-ROM player on selectcode 14 with an HP-IB address of 5, the mknod commands would be:

```
mknod /dev/dsk/CD-ROM5  b 0 0x0e0500
mknod /dev/rdsk/CD-ROM5 c 4 0x0e0500
```

Note that multiple CD-ROM players are supported with the same rules that apply to multiple CS80 disks.

And for the SCSI version of the CD-ROM drive:

Make the special files using the mknod command:

```
mknod /dev/dsk/CD-ROM1  b 7 0xssaa00
mknod /dev/rdsk/CD-ROM1 c 47 0xssaa00
```

where: CD-ROM1 is any meaningful name for the CD-ROM drive; for example, the name CD-ROM1 could be used for a CD-ROM at SCSI address 1. The major number is 7 for the block device and 47 for the character, or raw device.

0xssaa00 is the SCSI selectcode and address for the CD-ROM. 'ss' is the selectcode where 0e is typically the SCSI I/O card. The 'aa' digits refer to the SCSI address set on the back of the CD-ROM drive. On the SCSI bus, the boot disk is usually address 6 (address 7 is the computer) so the CD-ROM must be set to an unused address.

For example, to set up the CD-ROM player on selectcode 14 with an SCSI address of 0, the mknod commands would be:

```
mknod /dev/dsk/CD-ROM0  b 4 0x0e0000
mknod /dev/rdsk/CD-ROM0 c 47 0x0e0000
```

Note that multiple CD-ROM players are supported with the same rule as any SCSI disk drive (cable lengths, terminators, etc).

## Japanese LaserROM/UX

LaserROM goes international as one of the first LaserROM/UX products designed for non-English languages has been announced. Nationalization is done for both the windows (buttons, menu bars, etc) as well as for the text. Note that the display server must be able to accommodate 16 bit characters and have the required Japanese font files available. Contact your local HP Sales Representative for additional information on LaserROM foreign language products.

After connecting the drives, setting the address and rebooting the computer, test the disc drive with the /etc/diskinfo command as in:

```
/etc/diskinfo -v /dev/rdsk/CD-ROM0
```

which will report back details about the drive. If the command fails, the drive is not responding to the address specified in the minor number for the device file. Here are two example:

```
SCSI describe of /dev/rdsk/CD-ROM:
             vendor: TOSHIBA
         product id: CD-ROM DRIVE:XM
               type: CD-ROM
               size: 194044 Kbytes
   bytes per sector: 2048
```

or,

```
CS80 describe of /dev/rdsk/CD-ROM:
         product id:1707
               type: flexible or removable media
               size: 406269952 bytes
   bytes per sector: 256
```

### HP 9000 Series 700 Computers

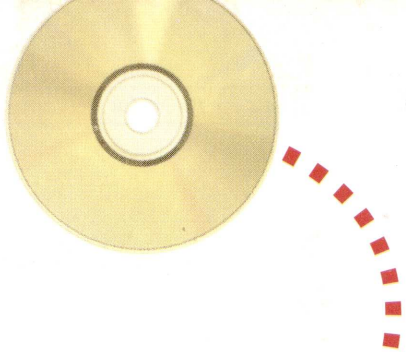
The SCSI CD-ROM drive (internal or external) is a normal SCSI disk drive, needing only the SCSI ID number to complete the mknod command. Assuming that the CD-ROM drive has been set to address 3, the following commands can be used to add the disc drive to the system:

```
/etc/mknod /dev/dsk/CD-ROM  b  7 0x201200
/etc/mknod /dev/rdsk/CD-ROM c 47 0x201200
```

Note that the name is CD-ROM, although this could be 2s0 or even c201d2s0; names for device files are not generally restricted on the 700 workstations. Although the CD-ROM drive cannot be written on (or formatted), creating both a block and raw device file is recommended. This allows the /etc/diskinfo utility to be used to identify the drive.

When media has been inserted into the CD-ROM drive, /etc/diskinfo may be used to verify correct connection of the drive. It performs a quick status check and reports the results.

For example:



```
/etc/diskinfo -v /dev/rdsk/CD-ROM
```

will report back details about the drive. If the command fails, the drive is not responding to the address specified in the minor number for the device file. Here is an example:

```
SCSI describe of /dev/rdsk/CD-ROM:
             vendor: TOSHIBA
         product id: CD-ROM DRIVE:XM
               type: CD-ROM
               size: 194044 Kbytes
  bytes per sector: 2048
```

In addition to the two device files, the kernel must have the driver 'cdfs' added before the media can be mounted. To check whether the kernel has cdfs installed, use SAM: Select the Kernel Configuration -> menu item and then Add/Remove Subsystems ..., which will then display the state of various subsystems including cdfs (shown as CD-ROM/9000) If not present, cdfs can be added with SAM or you can edit the file /etc/conf/dfile and add the line

```
cdfs
```

Its location is not important, although for readability it would be best to group it together with other filesystem statements like nfs. Then change directories to /etc/conf and type:

```
config dfile
make -f con g.mk
```

followed by a check to see if any errors were detected. If all is well, move the newly formed kernel to the root directory with the following two commands:

```
mv /hp-ux /SYSBCKUP
mv ./hp-ux /
```

Notice the ./ in front of hp-ux...this refers to the local file hp-ux in the current directory. Now you can reboot and proceed to the Installation of LaserROM.

### HP 9000 Series 800 Computers

In many ways, the 800 series is actually easier since the device files are created automatically by connecting the disc drive and then powering up the computer (HP-UX revision 8.0 and higher).

First, be sure to add the cdfs driver to the kernel if it is not already present. Verifying the presence of cdfs can be done with SAM. Select the Kernel Configuration -> menu item and then Add/Remove Subsystems ..., which will then display the state of various subsystems including cdfs (shown as CD-ROM/9000). If not present, cdfs can be added with SAM or you can edit the file /etc/conf/gen/S800 and add the line

```
include  cdfs;
```

Its location is not important, although for readability it would be best to group it together with other include statements. Then change directories to /etc/conf/gen and type:

```
uxgen S800
```

followed by a check to see if any errors were detected. If all is well, move the newly formed kernel to the root directory with the following two commands:

```
mv /hp-ux /SYSBCKUP
mv ../S800/hp-ux /
```

The first command makes a backup copy of the current kernel and the second moves the newly generated kernel to the root directory. Now you can perform a shutdown -h to halt the computer and then turn off the power before connecting the CD-ROM drive.

When the computer reboots, the CD-ROM should have been added to the /dev/rdsk and /dev/dsk directories. To verify this, run the command

```
ioscan -kf
```

which will show all the devices that the kernel knows and the LU number assigned to the device. Look for the CD-ROM drive's hardware path or address and verify that it has an LU number. The name of the CD-ROM drive will be: /dev/dsk/c#d0s2 where # is the LU number.

Test the disc drive with the /etc/diskinfo command as in:

```
/etc/diskinfo -v /dev/rdsk/c9d0s2
```

where c9d0s2 is the name of the CD-ROM drive's device file. This will report back details about the drive. If the command fails, the drive is not responding to the address specified in the minor number for the device file. Here are two example:

```
SCSI describe of /dev/rdsk/c9d0s2:
           vendor: TOSHIBA
       product id: CD-ROM DRIVE:XM
             type: CD-ROM
             size: 194044 Kbytes
  bytes per sector: 2048
```

or,

```
CS80 describe of /dev/rdsk/c9d0s2:
       product id: 1707
             type: flexible or removable media
             size: 406269952 bytes
  bytes per sector: 256
```

This completes the CD-ROM drive installation.

### Installing LaserROM/UX Code

Now make a directory where each CD-ROM will be mounted (also known as the mount point). Typically, this directory is at the root, although subdirectories are acceptable mountpoints too. The mountpoint will be used to reference the CD-ROM's file system and can be any meaningful directory name.

```
mkdir /CD-ROM
```

Insert the HP LaserROM/UX Installation disc or the HP LaserROM/UX Documentation disc into the CD-ROM drive and use the mount command to add the disc to the mounted file system. For example:

```
/etc/mount /dev/dsk/CD-ROM5 /CD-ROM -r -t cdfs
```

where /dev/dsk/CD-ROM5 is the name of the block special file for the CD-ROM drive. At this point, you should be able to see the files on the CD-ROM drive by typing:

```
ls /CD-ROM
```

The contents of the LaserROM disk will be listed. If the mount fails (typically: invalid argument), this is usually due to an incompatible disc placed in the CD-ROM player. LaserROM is currently recorded in ISO 9660 format (was High Sierra format). The cdfs code used to mount the disc can read only those two formats.

If the mount fails but the CD-ROM drive is never accessed (i.e., the activity light on the drive does not blink), the device file should be checked for the correct selectcode and HP-IB address.

To view the revision date of the disc, type the following command:

```
more /CD-ROM/BIN/LASERROM.VER
```

Note that all filenames on LaserROM discs are UPPERCASE. The file LASERROM.VER will show something like this:

```
A.02.03
HP-UX
1992 09 01
HP LaserROM HP-UX
HP LaserROM HP-UX
HP LaserROM HP-UX
```

where A.02.30 refers to the revision of the LaserROM disc format, HP-UX refers to the documentation contained on this disc, and 1992 09 01 is the date code in the format yyyy mm dd.

To complete the LaserROM installation, print a copy of the README file in /CD-ROM/UXINSTAL/README and follow the directions. This two-page document can be printed directly from the LaserROM disc using the lp command. You will be using the update program to perform the installation, which will take about 5 minutes.

The new version of LaserROM/UX is version B.00.00 and can only be installed and run on HP-UX Operating System Release 8.0 or later. The graphical user interface of Laser ROM/UX requires the X Window System version 11, Release 4 or later, also known as R4. Although not recommended, the new version of LaserROM/UX can be installed on an 8.0 (or higher) system and the graphical window can be redisplayed onto a pre-8.0 workstation. LaserROM/UX requires a user license for every concurrent copy of the program. If 12 users will be running LaserROM/UX at the same time, you will need 12 runtime licenses.

If you already have the old version of LaserROM/UX in-

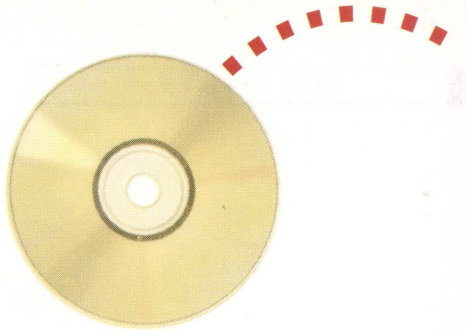


**FIGURE 2** *LaserROM/UX Compatibility Matrix*

The classic LaserROM/UX code did not have compressed TIF code incorporated into the program. Therefore, the classic LaserROM program MUST BE upgraded to B.00.00, the current version shipped on every LaserROM disc.

Starting with the June 1992 disc, LaserROM and InfoROM discs are in the new format (I'll call it LR2 format). The exception is MPE-V, which missed the window and was converted the next month. (The PC version running under Windows 3 can read either LR1 or LR2 discs without any changes)

Here is a compatibility chart:

| CD-ROM'S: RETRIEVAL SOFTWARE | <–MAY '92 ALL DISCS | JUNE '92 EXCEPT MPE-V | JULY '92–> ALL DISCS |
|---|---|---|---|
| PC version A.02.04 | ok | ok | ok |
| LaserROM/UX A.01.04 | ok | no access | no access |
| LaserROM/UX B.00.00 | no access | ok | ok |

The first note is that LaserROM-II isn't backward compatible so using the new software to read HP-UX 7.0 manuals or any discs dated prior to June '92 will simply not locate any databases.

Conversely, the classic LaserROM program (A.01.04) cannot read the LR2 datafiles so it will not access any discs from June '92 on (exception: MPE-V was updated July '92).

Note: LaserROM-II (version B.00.00) runs only on HP-UX 8.0 (all platforms).

stalled, the new version will not overlay any part of the old program files. Instead, LaserROM/UX version B.00.00 is a new program with new directories and a new way to start the program.

The new LaserROM/UX program cannot read the old CD-ROM discs dated prior to June 1992, and the old LaserROM/UX program cannot read the new discs from June 1992 and up. See figure 2 for a compatibility matrix.

If you plan to network LaserROM/UX, be sure to look at the article in the August 1990 *Interact* that discusses networking options.

To make the CD-ROM(s) mount automatically when the system is rebooted, you will need to make two changes:

**1.** Add the CD-ROM(s) to the file: /etc/checklist. Here is an example for adding three discs:

```
/dev/dsk/c7d0s2 /CD-ROM1 cdfs ro 0 0 # HP-UX 8.0
/dev/dsk/c8d0s2 /CD-ROM2 cdfs ro 0 0 # HP-UX 9.0
/dev/dsk/c9d0s2 /CD-ROM3 cdfs ro 0 0 # MPE-ix 4.0
```

Note that for 800 series systems, you must use section 2 of the disc for mounting. Using any other section will produce strange results. Each disc is mounted to a unique directory and must have the word cdfs followed by ro (for read-only) and then two 0's.

To test the entries, use the following commands:

```
/etc/mount -a -t cdfs
bdf
/etc/umount -a -t cdfs
bdf
```

This will mount and unmount all the CD-ROM discs.

**2.** You must add an entry to /etc/rc to mount the CD-ROM disc(s). Although all the HFS (or typical hard disks) are mounted within /etc/rc, the CD-ROM file system is type cdfs so it must be explicitly mounted. Look for text similar to this in your /etc/rc file:

```
hfsmount()
{
  # create /etc/mnttab with valid root entry
  /etc/mount -u

  # enable quotas on the root file system
  # (others are enabled by mount)
  [ -f /quotas -a -x /etc/quotaon ] && /etc/quotaon -v /

  # Mount the HFS volumes listed in /etc/checklist:
```

```
/etc/mount -a -t hfs -v
# (NFS volumes are mounted via net_start() function)
```

After the line /etc/mount, add the following lines:

```
# Mount the CDFS volumes listed in /etc/checklist:
/etc/mount -s -t cdfs -v

# Cleanup LaserROM after a hard reboot
echo
echo Cleanup /tmp and /usr/tmp for LaserROM
rm -r /tmp/LR*
rm -r /tmp/lrdira*
rm -r /usr/tmp/ft*
rm    /usr/tmp/LR*
```

The /etc/mount command with -t cdfs specifies that all the entries in /etc/checklist with a type cdfs will be mounted. The four rm commands remove any temporary files left by copies of LaserROM, for both the original version and the new version of LaserROM/UX. These files are small and contain directory information to speed up access to the CD-ROM.

After installing LaserROM/UX, you can obtain a printed copy of the LaserROM documentation by:

```
lp -oraw -d<your_LaserJet> /usr/lrom/doc/*.LJ
```

Note that these documents are in LaserJet (or DeskJet) format only and will require at least one megabyte of memory in order to print the graphic images. Since these files are more than 6 megabytes in total, you may wish to delete the /usr/lrom/doc directory after you finish printing the manuals.

Should you wish to reinstall the manuals at a later time, run update per the instructions in the README file, and rather than loading all the filesets, choose Select/View filesets, and then press the f6 key (View filesets) and move the cursor to LROM_DOC and type y to select this fileset. Then press f8 to return to the partition screen and start loading with key f4.

One additional task remains after installing Laser-ROM/UX: configuring printers. If you are running the standard lp spooler program with HP-UX, then there are no additional tasks to perform. If you are running the optional HP OpenSpool package, or other third-party spooler packages, you must edit the printer definition script found in /usr/lrom/prnlist.gen.

This script looks like:

```
..extra comments deleted
#
#
# Default Command: this command will filter out everything except for
# the printer names.

lpstat -v | awk -F: '{ print $1 }' | awk '{ print $3 }'
```

If you type the above command, you will see a listing something like this:

```
lpstat -v | awk -F: '{ print $1 }' | awk '{ print $3 }'
clyde
p3125002
p3125007
lj_k
lj_me

netlj3si

lj3_832
```

Notice the blank lines? Although these have no effect on LaserROM/UX, they can be cleaned up by adding the grep command at the end:

```
lpstat -v|awk -F: '{ print $1 }'|awk '{ print $3
                                    }'|grep -v "^$"
```

The grep command removes blank lines. The point is that prnlist.gen must produce a list of all the printers on the system, one line per printer name, with no additional text. You will need to modify this file to produce the printer listing shown here:

```
clyde
p3125002
p3125007
lj_k
lj_me
netlj3si
lj3_832
```



This will then be the list shown when printing from LaserROM/UX.

### Running LaserROM/UX

To start the program, the command is lrom. If you are using a graphical display, you set the environment variable $DISPLAY, or you may start the lrom program with the -display option as in:

```
lrom -display kobra:0 &
```

Notice the use of the & character to place the program in the background so that you get the shell prompt back immediately. When assigning the $DISPLAY value, it must be the name of the computer where the display is to appear followed by :0 or :0.0 to indicate the display number. Here's an example using sh or ksh as the shell:

```
DISPLAY=kobra:0
export DISPLAY
```

Now, just the lrom command may be used. If you are using a character terminal rather than a graphical display, the display option is not needed. LaserROM/UX runs on HP terminals as well as other non-HP terminals; be sure to look in the LaserROM/UX manual for a list of recommended terminals.

lrom may be run on one machine and the output (the graphical display) may appear on an X/terminal or another computer's display. Be sure to check if you have exceeded your LaserROM license count by counting the number of users currently running the lrom program. This can be done with:

```
ps -ef|grep lrom|wc -l
```

which returns the number of processes

**FIGURE 3** /usr/lib/X11/app-defaults/LRom file:

```
###
###  HP LaserROM/UX Application Defaults:
###  ------------------------------------
###
###  This file contains the recommended Application Defaults for HP
###  LaserROM/UX.
###  This file may be copied to the users home directory, and then changed
###  if the user desires different defaults than the system defaults.
###

###
###  BrowseWidth is the width of each panel in the browse window,
###  measured in font spaces.
###

### LRom*browseWidth:        35 ... orig ...
    LRom*browseWidth:        56

###
###  If you are running VUE use only these resources.
###  If you are not running VUE uncomment the color or monochrome
###  resources, whichever apply to your system. ###

    LRom*hitTermfg:          NavyBlue
    LRom*hitTermbg:          Pink

###
###  If you have a color monitor, without running VUE the following settings
###  are recommended.
###  To use these settings, remove the pound signs in the beginning of each
###  line.
###

    LRom*fontList:           helvb12
#   LRom*Font:               courr18 ... orig, use on hires only ...
    LRom*Font:               courr14
    LRom*Foreground:         White
    LRom*Background:         CadetBlue
    LRom*highlightColor:     Yellow
    LRom*hitTermfg:          NavyBlue
    LRom*hitTermbg:          Pink

###
###  If you have a monochrome monitor, the following default settings are
###  recommended. To use these settings, first comment the VUE or color monitor
###  settings out, by adding a leading "#" in the first column of each line.
###  Then, uncomment these settings by removing the leading "#" from each line.
###
#
#
#   LRom*fontList:           variable
#   LRom*Font:               courr18
#   LRom*Foreground:         White
#   LRom*Background:         Black
#   LRom*highlightColor:     White
#   LRom*hitTermfg:          Black
#   LRom*hitTermbg:          White
```

with the text "lrom".

The lrom program will start and by default will look at the mountpoint /CD-ROM as the location of the LaserROM documentation disc. If this is not the mountpoint for the disc, or if you would like to add additional CD-ROM drives for multiple discs, edit the file /usr/lrom/.lromrc according to the instructions in the file. Here is an example of a customized .lromrc file:

```
# HP LaserROM/UX-II CD-ROM mount point file
#
# cdpath = <mount directory> (repeat as necessary)
#
# For the Atlanta Response Center:
#
# /CD-ROMs/CD-ROM2 = HPUX 8.0
# /CD-ROMs/CD-ROM3 = MPE-iX
# /CD-ROMs/CD-ROM4 = MPE-V
# /CD-ROMs/CD-ROM5 = MPE-XL 3.1
# /CD-ROMs/CD-ROM6 = HP-UX 9.0
#
#
 cdpath=/CD-ROMs/CD-ROM2
 cdpath=/CD-ROMs/CD-ROM3
 cdpath=/CD-ROMs/CD-ROM4
 cdpath=/CD-ROMs/CD-ROM5
 cdpath=/CD-ROMs/CD-ROM6
```

Notice that multiple cdpath commands are allowed. These discs will be displayed on the Library window when LaserROM/UX first starts. Modify the.lromrc as needed. For customization, individual users may edit a copy of /usr/lrom/.lromrc and copy it to their $HOME directories. This can be used to show only those discs needed by specific users.

### Customizing lrom on Startup

There are several places where lrom's appearance can be controlled. These are:

- the command line as in:

```
lrom -bg red -fg white
```

or

- /usr/lib/X11/app-defaults/LRom

The man page for lrom will list the resources available to customize LaserROM/UX. However, placing all of the options on the command line can be a bit cumbersome so use of the global X resource file /usr/lib/X11/app-defaults/LRom file simplifies this task considerably. This file is searched first for any resources to be applied to a copy of lrom. If the user has included some or all of the resources in a local $HOME/.Xdefaults or in an X resource file such as .xrdb, then these local values will override any set in the global file.

Finally, any resources listed on the command line will override anything preset in the X environment. Refer to

**FIGURE 4**

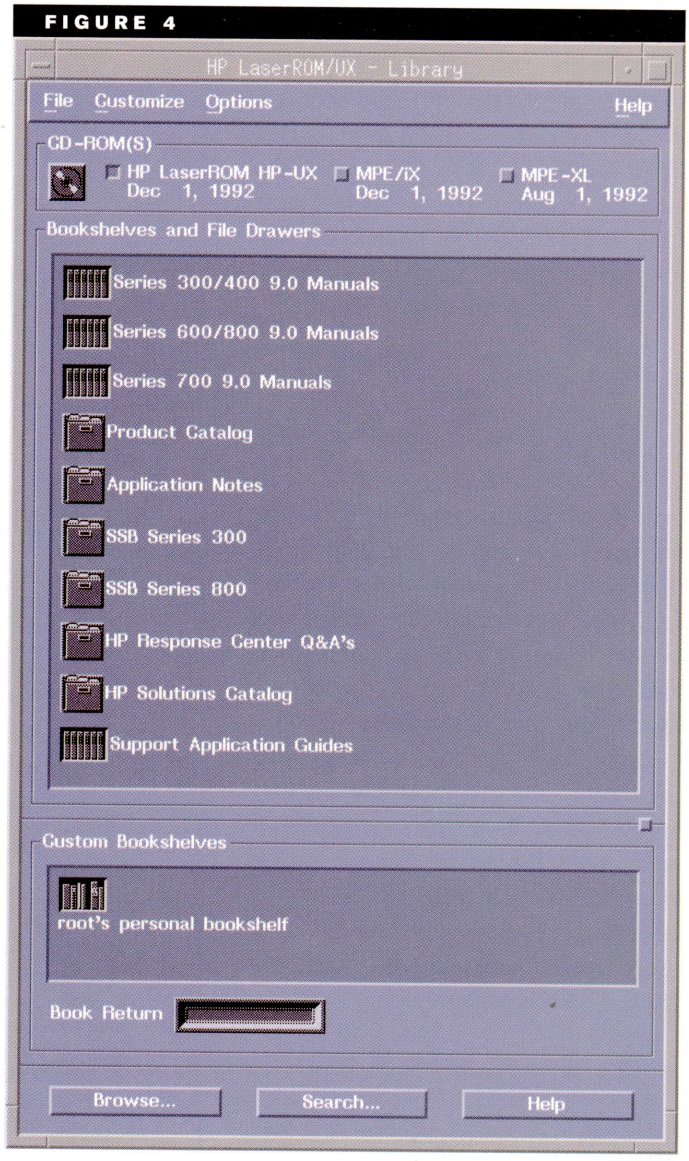
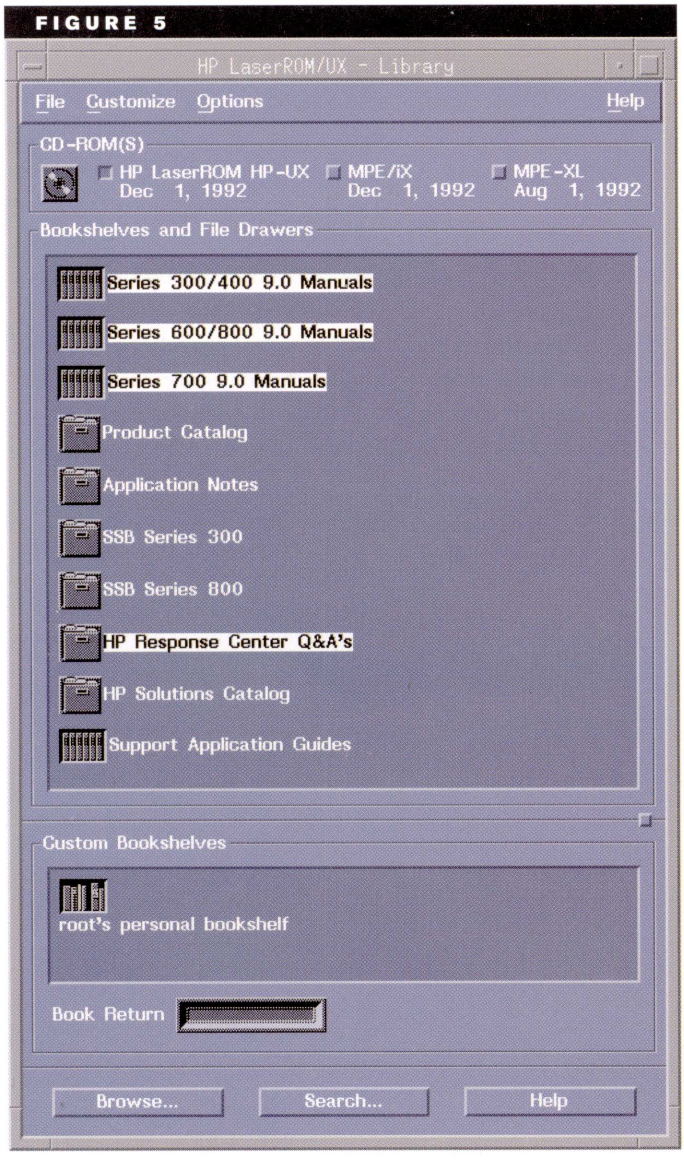


figure 3 for an example of the LRom resource file. If you are running VUE, be sure to set only these resources:

```
LRom*browseWidth:      35
LRom*hitTermfg:        NavyBlue
LRom*hitTermbg:        Pink
```

The values can be changed but the rest of the resources such as LRom*Foreground should not be set, thus allowing VUE's environment and color palette to control the appearance of lrom.

**FIGURE 5**




## The Library Window

The initial window (after the Copyright screen) is the Library screen (figure 4) and this will show all the mounted CD-ROM discs that are LaserROM compatible. If you have multiple CD-ROM drives, you must change the file: /usr/lrom/.lromrc to reflect the other mount points for the discs as previously mentioned. In figure 4, three CD-ROMs have been mounted and are found across the top of the Library screen.

The first disc shown across the top will be the newest disc by date. For additional discs at the same date, the order then follows the .lromrc file's order. When the Library window first appears, the Bookshelves and file Drawers will display the contents of the first disc.

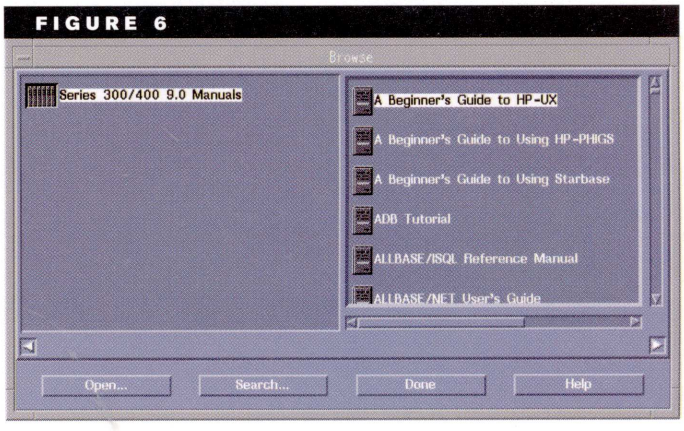
To add more discs to the list, just click once on any part of the disc's title. The three-dimensional button will be depressed when the selection is active, and will toggle back to a raised position if it is not selected. Notice the scroll bar that appears to the right when additional discs are selected. This bar can be moved to view additional books and folders.

To become familiar with LaserROM/UX, you can simply double-click on one of the bookshelves and a Browse window will pop-up. If you see the message: *Sorry, only books can be placed in custom bookshelves*, then you selected a folder and moved the mouse slightly during the double-click.

When you double-click, depending on the speed of your computer, it may be a second or so before the hourglass shows up indicating action is occurring. Moving the mouse and clicking again can confuse LaserROM so be sure to wait for a bit if lrom is running on a slower machine like the HP 9000/360 or the HP 9000/840.

Another way to select Bookshelves for Browsing is to

**FIGURE 6**



click once on each bookshelf of interest (figure 5) and each item will be highlighted. Then select Browse (at the bottom of the window) and a new window called Browse will pop up. This window shows the bookshelves and folders shown on the left while the contents of the highlighted bookshelf are shown on the right (figure 6). Note that the colors used in the figures were selected by starting lrom with new colors for all the windows.

To look at a specific manual, highlight the desired manual by clicking once on the icon or text of the manual and then click on Open at the bottom of the window. A shortcut is to double-click on the desired manual. Note the scroll bar on the right which allows moving up and down through the books.

### The Reader Window

Rather than jumping directly into the first page of text, the Reader window (figure 7) first appears with the Table of Contents shown, to make it easier to view the book at a glance. To read a section, click on any text line that has an arrow pointing to that line. The image will change to the text of that page (figure 8).

With keys to move through the document and search for text strings, the Reader window is very versatile, albeit a bit intimidating at first. Be sure to experiment; LaserROM is designed for the browser as well as the power user. Located at the bottom of the Reader window are the buttons needed to move around in the manual, including Contents (for table of contents), Index (for the index at the end of the document), Library (which returns to the Library window), Snapshot (discussed later), Close, and Help.

A feature often overlooked by the new user is the ability to search on a keyword while browsing through the manuals. To do this, activate the cursor in the box marked Pattern Match and then type in some text. By pressing the Return key, the word will be searched throughout the current manual. There is an Option item at the top of the window that can be used to restrict a pattern match to just one section of the manual, but usually you will want to search the entire book when using the Reader window.

Another feature of LaserROM/UX is the ability to navigate rapidly through the documents using such features as the History button. This button allows you to go back to previously viewed sections by clicking on the left arrow next to History: and to move forward with the right arrow. Similarly, the Section: buttons allow you to thumb through section by section.

Another feature is the ability to take a snapshot or copy of the current window for future reference (figure 9). This window is a copy of the current window and may be iconified for recall at a later time. Note that this snapshot window will stay

**FIGURE 7**

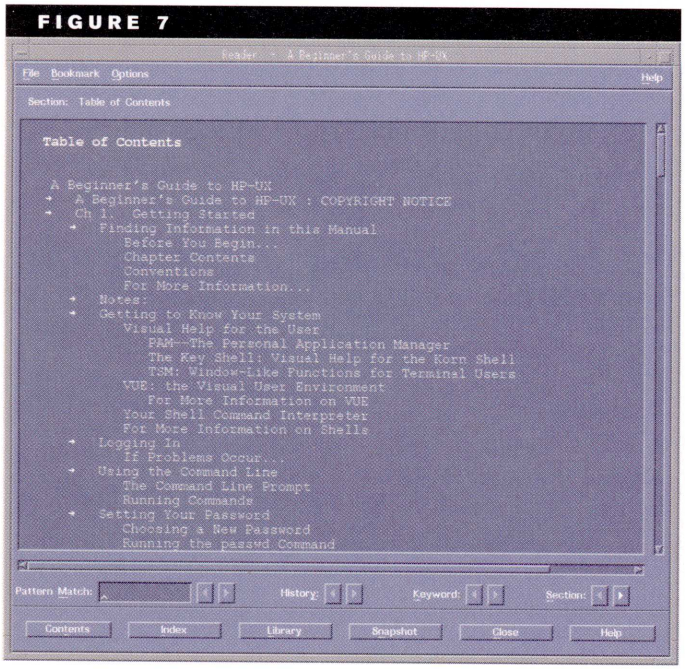



**FIGURE 8**

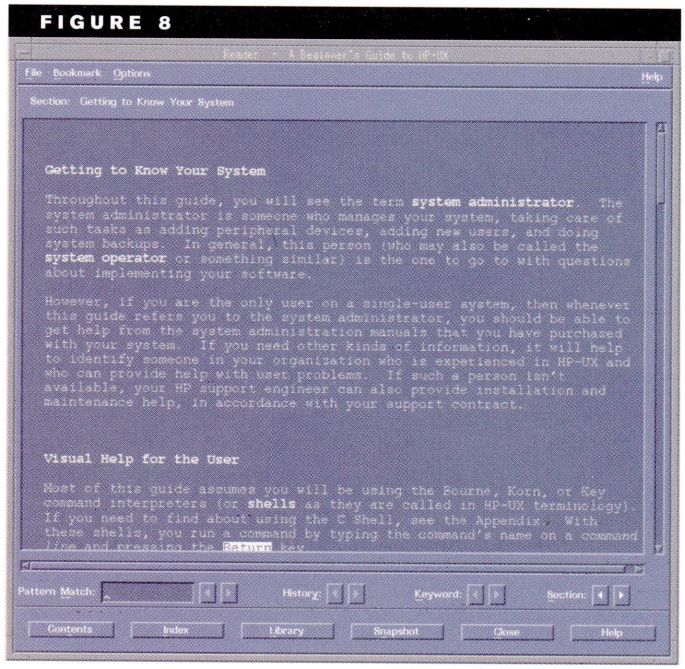




**FIGURE 9**

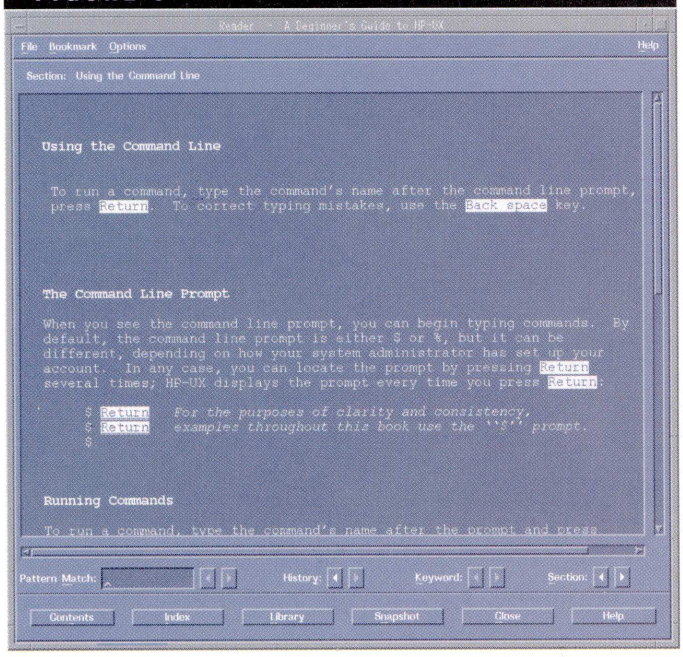
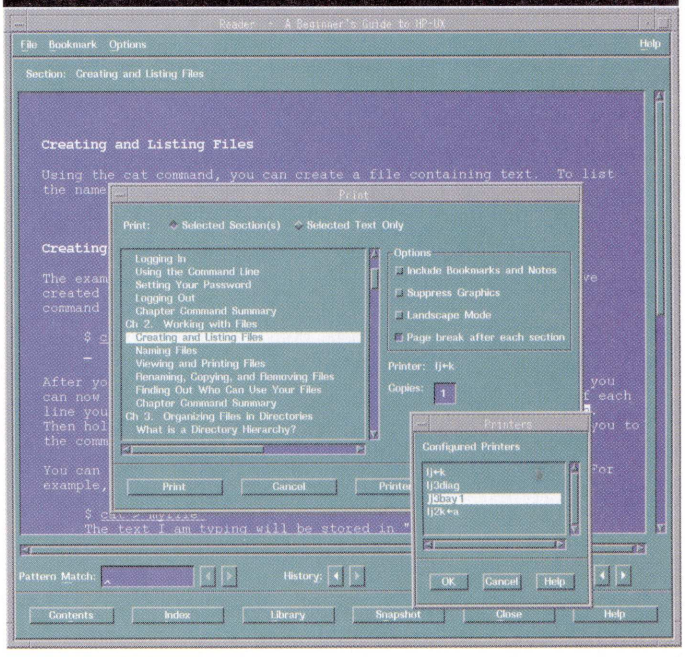



**FIGURE 10**




even if you change the Library window to select different manuals or even different discs.

If you'd like to print a copy of this, you click on the file selection at the upper left of the menu bar, and click on Print. The new window (figure 10) has the sections listed as well as options for printing. If the printer listed is not correct, click on the Printers... button and select from the list shown. If the list is blank, check the horizontal scroll bar in the Configured Printers box — it may be pushed to the right, in which case you can click on the left side of the scroll bar and it will return to normal. If no printers are shown, check the prnlist.gen script in /usr/lrom for possible errors.

## The Search Window

For a more thorough search, you may return to the Library window and after selecting some bookshelves and folders, click on the Search window and the Search window will be displayed (figure 11). By entering some keywords into the Search for: box, all the selected manuals can be searched. These books may even reside on different discs (as selected in the Library window) for a very complete search.

To look for just a title, for example, the man page for a topic, click on the diamond-shaped button labeled Headings rather than on the default button labeled Text. This will find selections where keywords appear in the title, which can be somewhat faster, and also limits the search to topical rather than general choices.

When the search is completed, the books on the right of the search window will be arranged in order of the number of occurrences for the keywords. This can be changed to the order found in the bookshelf (in the Library window under Search options, the Rank results choice). See

**FIGURE 11**

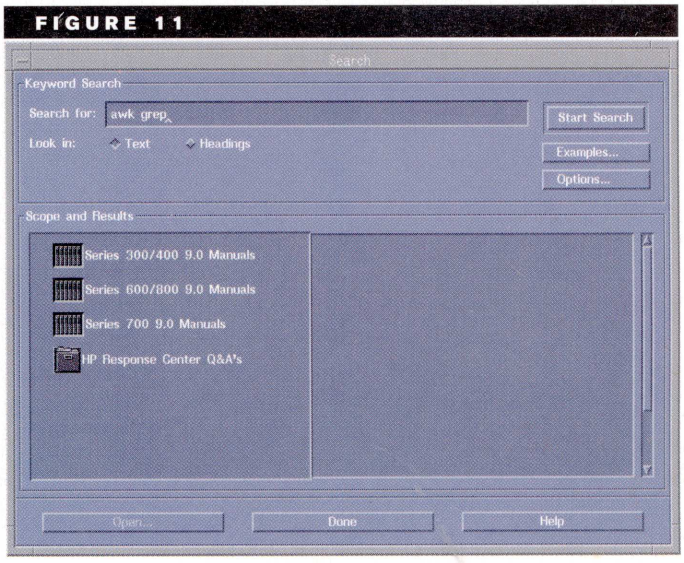


**FIGURE 12**

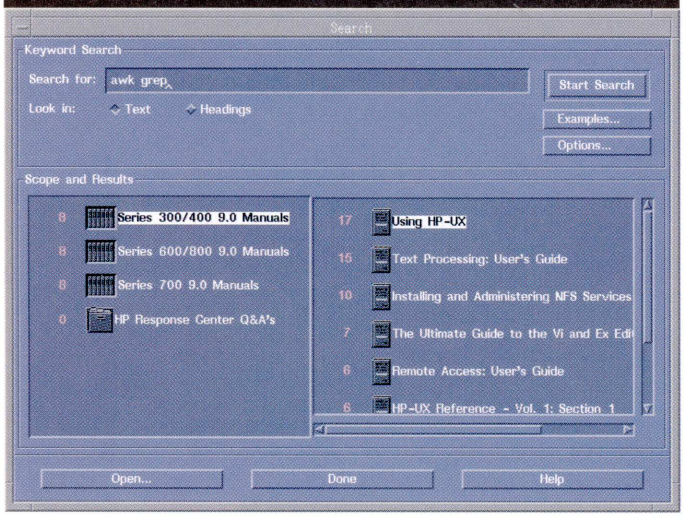



**FIGURE 13**

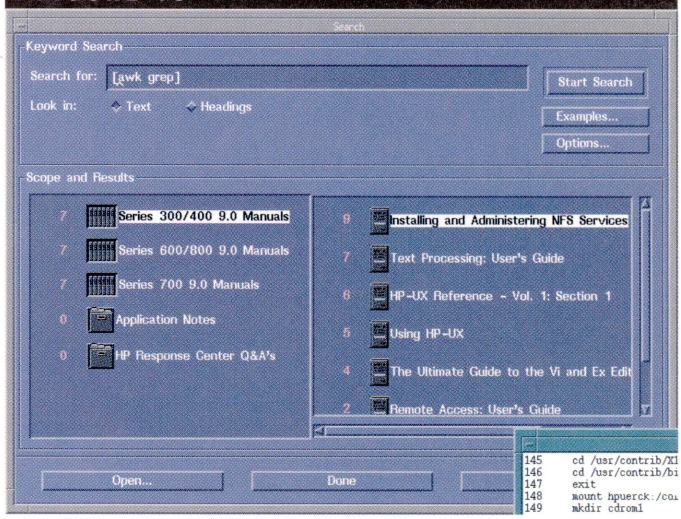


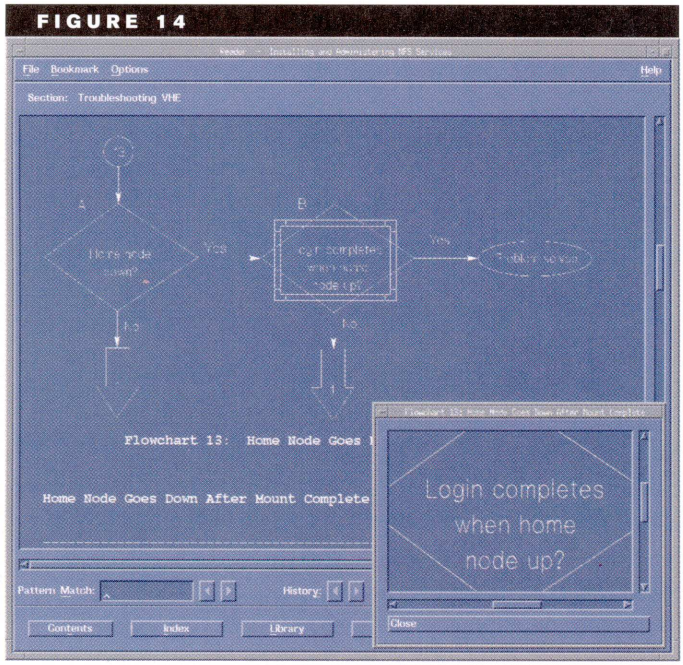

figure 12 for an example of several hits.

In many instances, keywords are often to be found in the same context or same sentence. To search for this connectivity, LaserROM has provided the [ ] construct, which indicates that the enclosed words are to be within a certain number of characters of each other. Thus, to search on single user mode, the search pattern would be: [single user mode]

Searches can also be approximated by using the * character to indicate trailing text (zero or more characters), or exact phrases can be stated with the use of quotes as in "regular expression."

Many words are synonyms for each other and LaserROM has a feature called a Thesaurus that makes acronyms, abbreviations, and common suffixes equivalent to each other. An example might be HP, which will also find occurrences of H-P, Hewlett-Packard, and Hewlett Packard, or memo, which will also find memos, memoranda, and memorandum. This feature can be disabled with the Search option settings.

**FIGURE 14**




In figure 13, the entire screen has been displayed to show the relationship between the main window (the Library screen) and the Search screen. This pair (or the Library and Browse windows) can be iconified separately from the Reader window to make the display easier to read.

## Bookmarks and Graphics

There are a number of special features in Laser ROM/UX, including the ability to place Bookmarks or margin notes into the manuals. These notes can be used to explain a topic on which the manual is not clear, or to add new information not currently documented. Be sure to look at the *LaserROM/UX User's Guide* for details on Bookmarks.

Lastly, we'll look at graphic objects, which are often the best method to display complex relationships. Graphic images occupy more than 80 percent of the disc space for LaserROM discs and are stored in a compressed format. When a doc-



ument contains a graphic image, it will be expanded automatically and displayed as best as possible on your graphics monitor. Note that the images on the CD are high-resolution and thus mapping these images to the lower resolution of a workstation may cause narrow text and lines to disappear.

In figure 14, a flowchart for troubleshooting VUE problems has been selected and you will notice that the image in the larger window is not easily readable. By using a click-and-drag over the area of interest, a zoom window is created that will show the magnified image. The image can be positioned with the scroll bars in the zoom window itself, or the click-and-drag box can be resized or moved and the zoom window will display the new area of interest.

Graphic data is always printed at full resolution using PCL (only) codes. Graphic images can be quite large and an HP LaserJet will need almost one megabyte of internal memory to print the largest images. If you have a PostScript printer, you will need a PCL-to-PostScript filter program to change the format of the data.

### Character Mode for LaserROM/UX

Not everyone has a graphical display device, thus LaserROM/UX provides the terminal user with a powerful character mode interface. figure 15 shows an example of the initial window for lrom in the character mode. Although the window looks a bit complicated, it is fairly easy to navigate.

The first rule is to learn the navigation keys such as the arrow keys and TAB key, which will allow rapid movement from section to section. The upper left-hand box (marked Available Shelves and Drawers) contains the list of CDROM discs with the letter A: designating the first disc, B: the second and so on. Anything highlighted in the upper box has been selected for subsequent searches...the lower left box (marked Search Scope/Browse Scope) shows a list of the selected items.

To unselect or select an item, move to the appropriate box using the TAB key and then the arrow keys to move up/down within the box. Pressing the RETURN key will toggle the selection, that is, turn on/off the highlight bar. When changing selections in the Available box, the Search/Browse box will be updated to show the new choices. Both boxes will scroll up or down to accommodate any length list.

In figure 15, you can see that the first four bookshelves have been highlighted in the Available box and in the Search/Browse box, Series 400/400 9.0 Manuals have been highlighted. Note that when an item is highlighted in the Search/Browse box, the number of books or volumes is printed to the right, in this case, 184 volumes. At the same time, the right half of the screen changes to a list of the volumes in alphabetical order. In figure 16, 3 items have been selected (HP Solutions, Series 700 Manuals and Application Guides) and these choices are shown in the Search/Browse box. The Series 700 Manuals have been selected (194 volumes in the set) and a list of the manuals appears in the right half of the screen. By using the TAB key to move to the right half of the screen, you can select the Beginner's Guide to HP-UX by moving the cursor to that line and pressing RETURN.

The next screen (figure 17) shows the Table of Contents for

**FIGURE 15**

```
hpterm
  File=^F  Edit=^E  View=^V  Help=^G      Library screen, HP LaserROM/UX
+--Available Shelves & Drawers--+----titles in selected Shelf/Drawer----+hits+
|A:Series 300/400 9.0 Manuals   |A Beginner's Guide to HP-UX            |     |
|A:Series 600/800 9.0 Manuals   |A Beginner's Guide to Using HP-PHIGS   |     |
|A:Series 700 9.0 Manuals       |A Beginner's Guide to Using Starbase   |     |
|A:Product Catalog              |ADB Tutorial                           |     |
|A:Application Notes            |ALLBASE/ISQL Reference Manual          |     |
|A:SSB Series 300               |ALLBASE/NET User's Guide               |     |
|A:SSB Series 800               |ALLBASE/SQL C Application Programming G|     |
|A:HP Response Center Q&A's      |ALLBASE/SQL COBOL Application Programmi|     |
|A:HP Solutions Catalog         |ALLBASE/SQL Database Administration Gui|     |
+-------------------------------+ALLBASE/SQL FORTRAN Application Program|     |
+--Search Scope/Browse Scope--#vols+ALLBASE/SQL Message Manual         |     |
|Series 300/400 9.0 Manuals(b| 184|ALLBASE/SQL Pascal Application Programm|     |
|Series 600/800 9.0 Manuals(b|    |ALLBASE/SQL Quick Reference Guide      |     |
|Series 700 9.0 Manuals(books|    |ALLBASE/SQL Reference Manual           |     |
|Product Catalog(folders)    |    |ALLBASE/SQL Release F.0 Application Pro|     |
|                            |    |Administering ARPA Services            |     |
|                            |    |AdvanceMail User Guide                 |     |
|                            |    |Architect 2.0 Developer's Guide        |     |
|                            |    |Architect 2.0 Getting Started Guide    |     |
|                            |    +---------------------------------------+-----+
+-text search:-
Press the Return key to open this book; use Tab & arrows to move around.
 f1   f2   f3   f4   hpterm   f5   f6   f7   f8
```

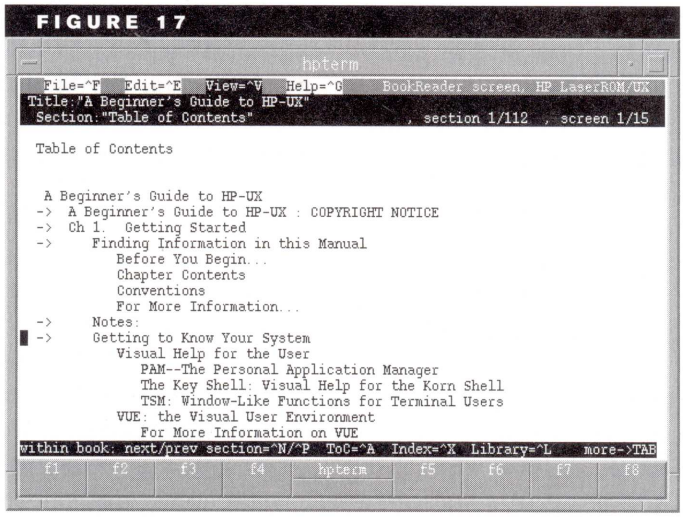
**FIGURE 16**

```
hpterm
  File=^F  Edit=^E  View=^V  Help=^G      Library screen, HP LaserROM/UX
+--Available Shelves & Drawers--+----titles in selected Shelf/Drawer----+hits+
|A:Series 700 9.0 Manuals       |A Beginner's Guide to HP-UX            |     |
|A:Product Catalog              |A Beginner's Guide to Using HP-PHIGS   |     |
|A:Application Notes            |A Beginner's Guide to Using Starbase   |     |
|A:SSB Series 300               |ADB Tutorial                           |     |
|A:SSB Series 800               |ALLBASE/ISQL Reference Manual          |     |
|A:HP Response Center Q&A's      |ALLBASE/NET User's Guide               |     |
|A:HP Solutions Catalog         |ALLBASE/SQL C Application Programming G|     |
|A:Support Application Guides   |ALLBASE/SQL COBOL Application Programmi|     |
|B:MPE/iX 4.0 Reference Manuals |ALLBASE/SQL Database Administration Gui|     |
+-------------------------------+ALLBASE/SQL FORTRAN Application Program|     |
+--Search Scope/Browse Scope--#vols+ALLBASE/SQL Message Manual         |     |
|Series 700 9.0 Manuals(books| 194|ALLBASE/SQL Pascal Application Programm|     |
|HP Solutions Catalog(folders|    |ALLBASE/SQL Quick Reference Guide      |     |
|Support Application Guides(b|    |ALLBASE/SQL Reference Manual           |     |
|                            |    |ALLBASE/SQL Release F.0 Application Pro|     |
|                            |    |ARTCore Programmer's Manual            |     |
|                            |    |ASSEMBLY LANGUAGE Reference Manual     |     |
|                            |    |Administering ARPA Services            |     |
|                            |    |AdvanceMail User Guide                 |     |
|                            |    +---------------------------------------+-----+
+-text search:-
These are the Books (Folders) contained in the selected Shelf/Drawer.
 f1   f2   f3   f4   hpterm   f5   f6   f7   f8
```

the Beginner's Guide to HP-UX. As in the graphical version of LaserROM/UX, opening the Reader screen always starts with the Table of Contents. The cursor has been positioned on the line: Getting to Know Your System. By pressing the RETURN key, the Reader window displays the actual text as in figure 18.

Text can be scrolled up/down with the arrow keys, and for extra-wide documents, the left/right arrow keys will scroll the text horizontally.

**FIGURE 17**




At any time, you can press CTRL-G for additional help in navigating the screens.

There are two other areas that are important to know: the top and bottom bars. The top will always be the main command menu, much like the menu bar in windows. To access the file menu, just press CTRL-F. The current menu selection will be highlighted and once a pull-down menu is active, you may shift the menu left or right, just as in graphics windows.

Figure 19 shows the Library screen but this time a keyword has been entered. By pressing RETURN in the Text Search box, all occurrences of the keyword will be located in those manuals that appear in the Search Scope box. Note also that the title of the lower left-hand box has changed to Search Scope—the Browse title has been removed indicating that a keyword search has been performed.

Note that on the right half of the screen, a list of the books containing the keyword (fbackup in this case) appears, sorted by the number of occurrences. If we position the cursor on the first line, System Administration Tasks, and press RETURN, then the Reader window appears with the Table of Contents as before...by positioning the cursor to the line: Determining How Often to Back Up Data and pressing RETURN, the data in figure 20 will be displayed.

At any time, the shortcut keys can be used from the top menu to navigate the various menus in LaserROM/UX, character mode. For instance, to select the file screen, type CTRL-F. Note that the character mode version will show the CTRL keys using the carat ^ symbol which means use the CTRL key in conjunction with the letter given.

I recommend browsing all the various menus to become familiar with the various features of the character mode version. Its power can only be fully utilized when all the keystrokes are second nature, and for ease of use, all the shortcut keys are shown at the top and bottom of the screen.

**FIGURE 18**

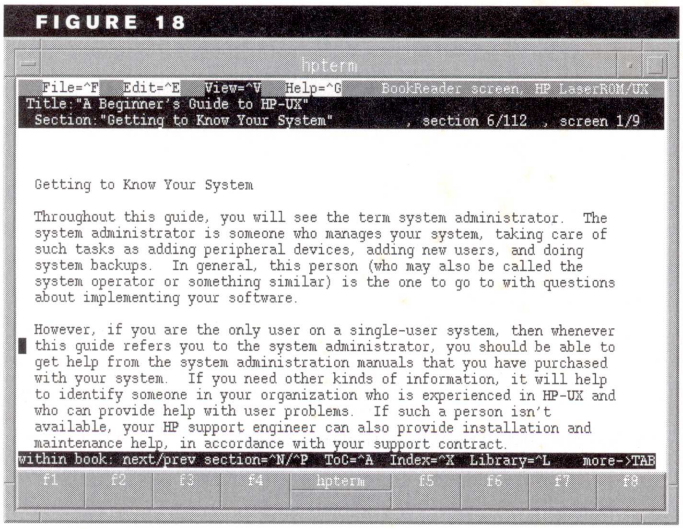



**FIGURE 19**

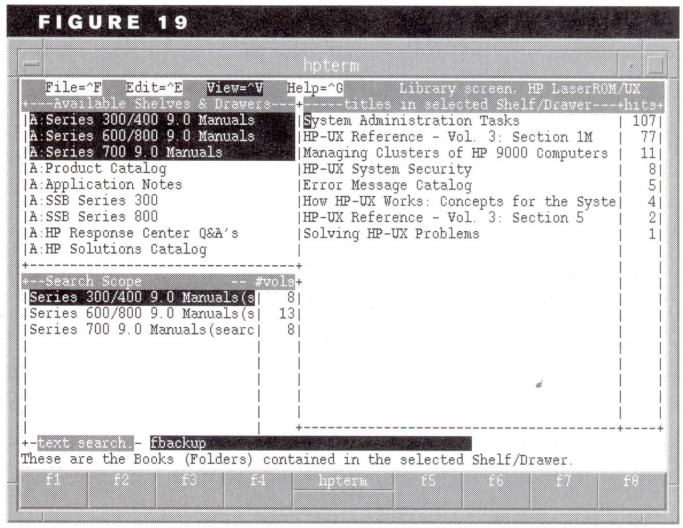
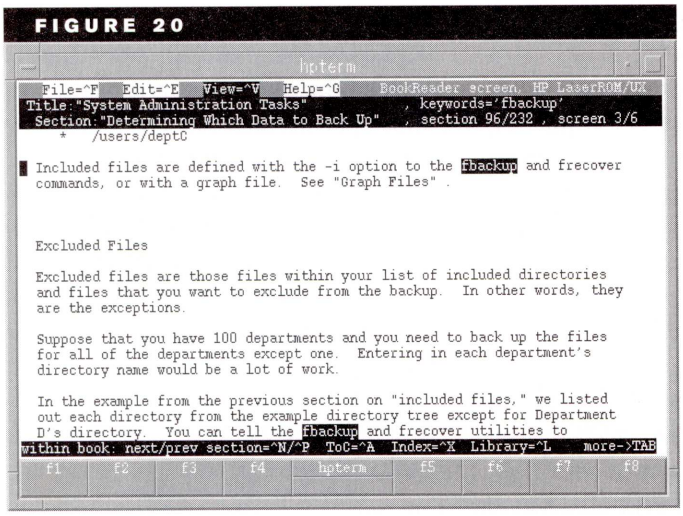


**FIGURE 20**




## In Summary

Having a solution online does not always solve the problem of distributed documentation. Indeed, many users will balk at the idea of losing their bookshelves and will tend to ignore HP LaserROM as a solution. So what steps can the site administrator take to encourage the use of HP LaserROM/UX as an information tool?

**1.** Publicize the direct cost of paper documentation:

Paper manuals are now priced separately and this cost is no longer insignificant. HP LaserROM subscriptions are far less expensive than multiple copies of the paper manuals.

**2.** Contrast the costs in paper maintenance versus HP LaserROM:

Often, the cost to maintain paper manuals far exceeds the initial cost of the manuals. Updates to manuals are shipped on a regular basis, yet the users seldom have the time to perform the update. Now, the manual is out of date unless the user also searches the page changes.

**3.** HP LaserROM discs provide a truly complete index:

Manuals have partial indices developed either manually or with the help of a word processor's indexing tools. In either case, an index of every interesting word is not often provided. HP LaserROM data discs have 100 percent coverage for interesting keywords (not every word is indexed; uninteresting words such as 'the' are dropped).

And LaserROM's thesaurus option allows finding words with extensions such as 's' or 'es'.

Here are some examples:

| KEYWORD ENDING IN: | HP LASERROM/UX LOOKS FOR THE SAME STEM ENDING IN: |
|---|---|
| y | y, ies, ie's |
| ey | ey, eys, ey's, ies, ie's |
| ies, ie's | y, ey, ies, ie's |
| eys, ey's | ey, eys, ey's |
| es, e's | e, es, e's |

For more examples, click on the Help menu or type CTRL-H and select the thesaurus subject.

**4.** Time to direct access of data can be much faster:

Sophisticated users may feel lost with HP LaserROM since its appearance is different from that of the paper copies. These users will often point to their 'Auto-parts' manual display, showing with pride the ability to locate information in a few seconds. With experience, the same users can become HP LaserROM/UX gurus and locate in even less time, the particular information needed.

**5.** Casual users find information much more quickly:

For system administrators, locating details on setting up a particular printer, or changing a network function may mean hours of searching paper manuals.

LaserROM/UX can be an excellent tool for the individual user as well as for the large systems administrator by providing immediate documentation on request. ◧

*Bill Hassell is a Hewlett-Packard Response Center engineer at the North American Response Center in Atlanta, Georgia. He has been supporting HP-UX software products since September 1990 and previously worked for 12 years in the Neely Sales Office in Mountain View, California, supporting HP 1000s and RTE.*

Welcome to *hp-ux/usr*, the new INTEREX publication for the HP-UX member. I am very excited about the opportunity to contribute to this publication and I look forward to sharing many interesting items over the coming months. In case you are new to the INTEREX family, I am the chairman of the Contributed Software Library for HP-UX, CSL/HP-UX (how we techie types love acronyms!).

The CSL is a collection of useful software submitted by the INTEREX members. By sharing the fruits of our labors, members hope to encourage others to so the same, increasing the value of the library for all. The role of the CSL committee is to encourage this sharing, to manage the library, and to produce an annual release.

1993 marks the fifth year of production for the CSL. Much of our success is a result of the hard work of Art Gentry, who single-handedly got it started back in 1988. Many thanks Art! The team has grown since then, with individuals coming and going as their jobs change back home. Despite the shifting of people, the CSL has continued to grow and branch out. I recently reviewed the progress the CSL has made since the beginning and I will share some of the numbers I came up with.

As you can see from Table 1, we have collected and released more than 200 megabytes of software to the HP-UX membership. It shows a real commitment on the part of the members to make the CSL a viable benefit of membership. Without the contributions to build on, the CSL would be much smaller and far less useful to the average user. I am also very satisfied with how well the swap tape has grown. The conference swap tapes continue to be the major source of new contributions for the annual release.

In my last column (*Interact*, January 1993) I reviewed some of the contributions from the 1992 release and the New Orleans Swap. I thought I would highlight three more that caught my attention in the area of integration.

**BSDTIMESYNC** (Synchronize Networked System Time)

Wendy King of the Naval Observatory provided this rather unique contribution. Keeping systems synchronized, especially in a time-critical environment, is always a challenge. This contribution will help keep your HP-UX systems "up-to-date," and she has provided the pieces to run under RTE-A as well.

**WHOZN** (Who is logged on)

Steve Gauss, also from the Naval Observatory, provides this multi-system util-

**TABLE 1** *HP-UX CSL and Swap Library*

| CSL RELEASE | NUMBER OF CONTRIBUTIONS | NUMBER OF CONTRIBUTORS | SIZE IN MEGABYTES |
|---|---|---|---|
| 2934 (1989) | 98 | 44 | 18.9 |
| 3046 (1990) | 44 | 22 | 5.6 |
| 3110 (1991) | 38 | 15 | 191.8 |
| 3217 (1992) | 47 | 20 | 81.9 |
| **SWAP RELEASE** | | | |
| Orlando (1988) | 10 | 7 | 21.1 |
| San Fran. (1989) | 27 | 14 | 4.0 |
| Boston (1990) | 21 | 9 | 142.0 |
| San Diego (1991) | 15 | 9 | 51.3 |
| New Orleans (1992) | 24 | 12 | 31.4 |

ity to determine who is logged on your system. WHOZN is another example of the ability to integrate RTE systems into the HP-UX environment. Users might find it interesting to study the implementation to get a feel for what is involved in integrating RTE and HP-UX.

**T**

This package was a featured paper at the 1991 San Diego Conference and consists of a collection of programs that function much like a remote procedure call (RPC). It facilitates the implementation of distributed applications and functions over a network, including RTE systems. Jean-Louis Matton has provided a very functional collection of programs, subroutine libraries, and sample implementations that should help users utilize this package to its advantage. ◧

*Paul Gerwitz is chairman of the CSL/HPUX committee and is a system analyst at Eastman Kodak Company in Rochester NY. He can be reached at 716-477-3067 or e-mail at gerwitz@interex.uucp or gerwitz@ kodak.com*


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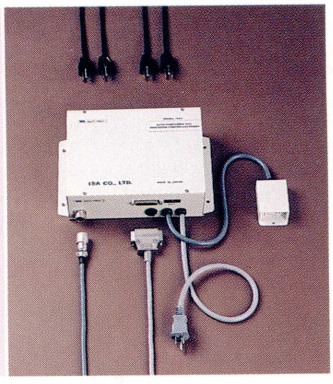
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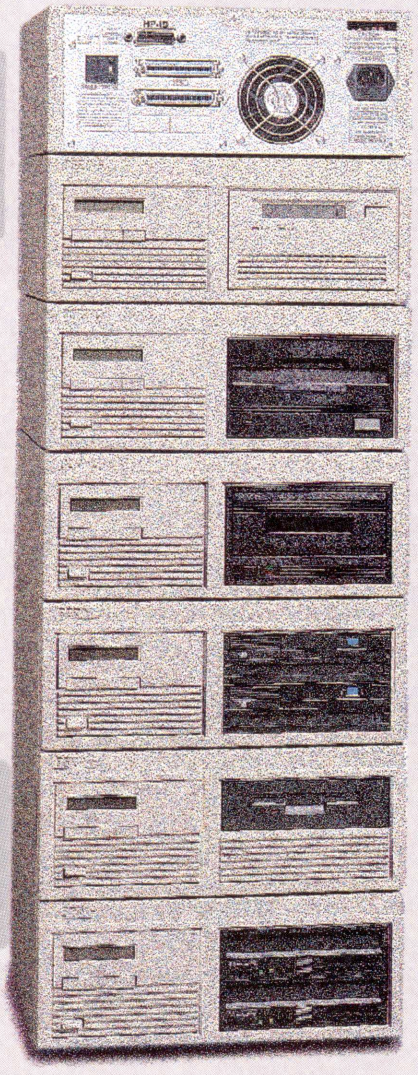
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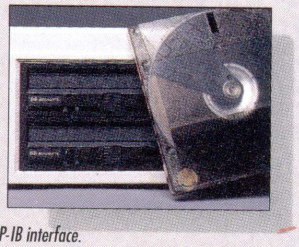

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CIRCLE 24 ON READER CARD




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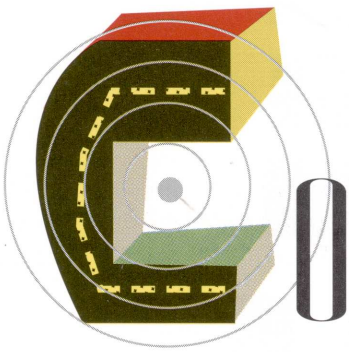
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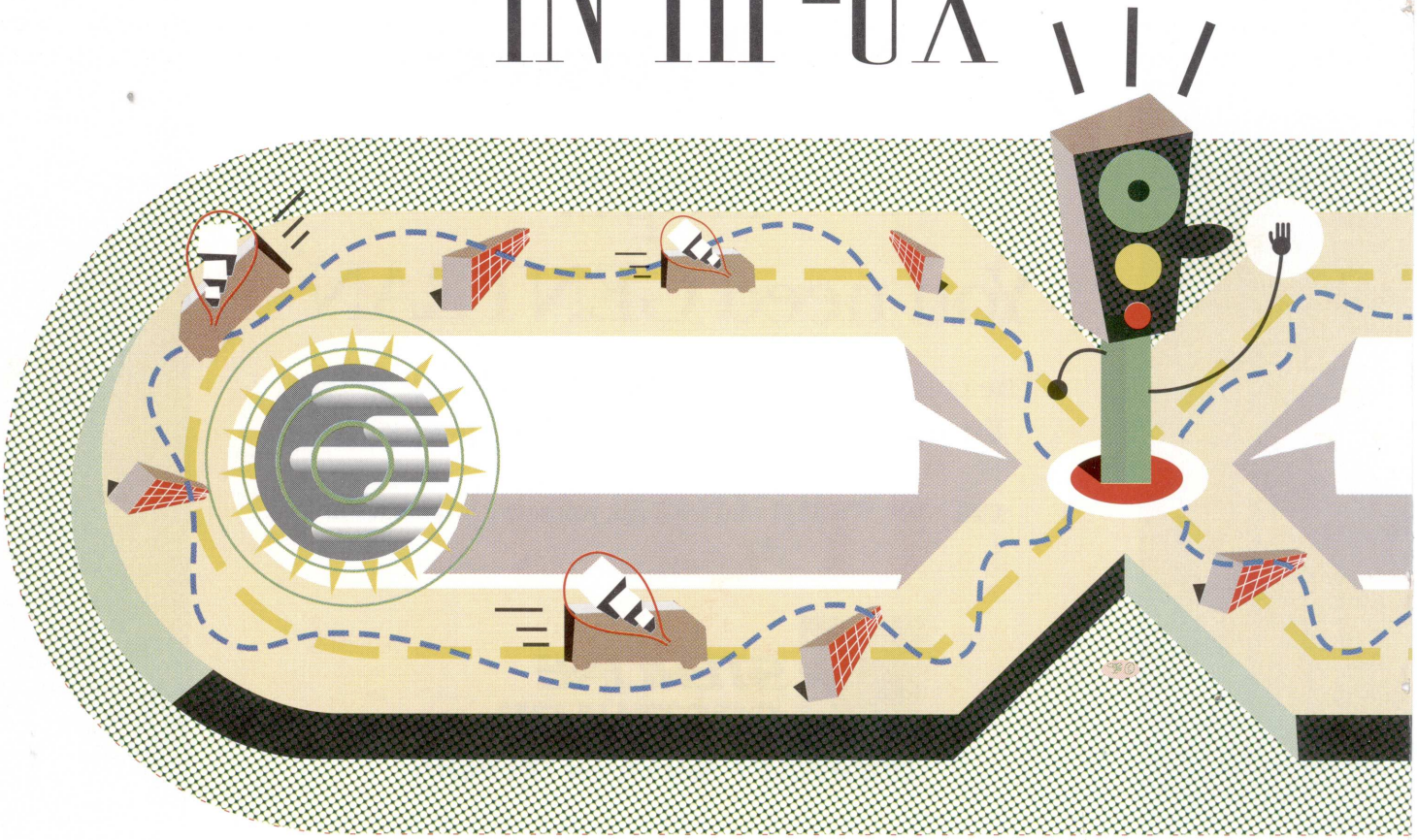
**CIRCLE 16 ON READER CARD**



# CONFIGURING TERMINAL AND MODEM PORTS IN HP-UX

## Understanding *getty* and *login*

*by John A. Pezzano*



MANY PEOPLE MISUNDERSTAND how to set up serial terminal data communications in HP-UX. While there are tools such as **sam**[1] to help the system administrator set up terminals and modems, only an understanding of the programs involved allows the administrator to configure ports to work properly with certain applications and to prevent confusing data displays.

## AN OVERVIEW OF THE PROGRAMS AND FILES

The programs involved in terminal or modem connection are **init** and **getty**. These programs together provide the user with the **gettydefs** file, configure the serial ports, and start the user's initial login process.

### Init

**Init** is the parent of all the other programs on the system. If you execute **ps -ef** on your system, you will see a process identification number (PID) and a parent process identification number (PPID) for each active program. If you trace back the parent process and look at its PPID, you will find they all trace back to **init**, which has a PID of 1.

When **init** first runs, it looks in the file **/etc/inittab** for the programs to start. For terminal ports, the process to be scheduled on each port is **/etc/getty**. This is done by having an entry in **/etc/inittab** that is of the form

identifier:state:action:program to execute

A sample looks like

```
tt01:2:respawn:/etc/getty -h -t 60 ttyOp1 9600
```

where:

The *tt01* represents the unique identifier. The **man** pages recommend that this be four characters, but fewer are permitted. Failure to make this unique will result in the program never being executed.

The **2** is the run state. The default multi-user state is state **2**. When running in single user mode (state s), this process would not be executed. Multiple states can be specified, such as **23**, which would cause the process to be run in both state **2** and state **3**. This can be useful in such situations as when the administrator might wish to disable certain ports during certain times. For example, one may wish to disable certain ports at night or prohibit modem access when processing paychecks.

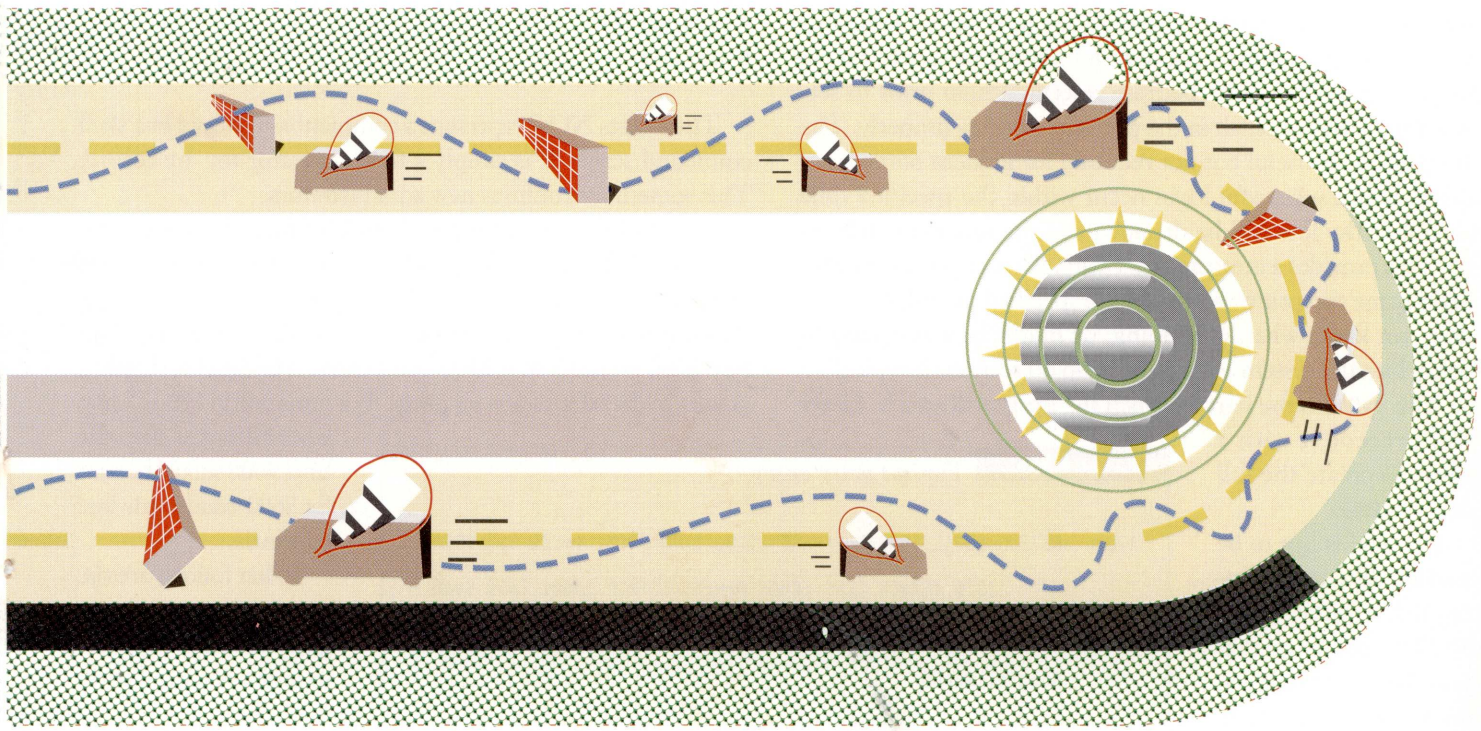


ILLUSTRATION BY JOHN HERSEY

By enabling all ports in state **2** and only certain ports in state 3, changing states by executing **init 3** will disable any login attempts from those ports without the **3**.

The **respawn** tells **init** that if the process dies for any reason, it should be restarted. Thus when a user logs off and the shell disappears, **init** restarts (respawns) the **getty** process. If the user fails to log in within three attempts, **login** terminates and **init** also respawns **getty**. In either case, the system signals **init** that its child process has terminated by sending it a signal 18.

To disable a port, use an **off** instead of **respawn**. This allows you to keep the entry in the **inittab** file without it doing anything.

What follows is the program to be executed and all its parameters. For terminals and modems, the program **getty** is used.

### Getty

**/etc/getty** is the process used to set up serial terminal and modem ports and to provide the initial login prompt.

In the typical case, its parameters look like:

```
/etc/getty -h -t 60 tty0p1 9600
```

where the **-h** tells **getty** not to reset the port before setting its speed. It is an optional parameter for hardwired[2] ports but required for modem ports because resetting them prior to setting the speed can result in the port not working properly. The **-t** 60 option is useful but not required for modem ports. It requires that a successful login occur within the specified time period or the line will be dropped and the modem will hang up. This provides a measure of security. If a user cannot type his login name and password within the specified period, he either does not know what he is doing, or might be attempting to break into the system. A time of 30 to 60 seconds is typical.

The *tty0p1* is the port to which the **getty** will attach. **Getty** will precede it with a **/dev/** to create the full device name.

If a port is not to be used for login, e.g., a printer port, a **getty** should NOT be set up on that port. Be careful that you do not set up multiple **getty** entries for a single port. This most often will occur when a user sets up a port as hardwired, then later decides to change it to a modem port.

The last parameter, *9600*, is probably the one most misunderstood by system administrators. It does NOT represent the baud rate of the port but in fact represents a label in the **/etc/gettydefs** file.

The **getty** program sets up a terminal port, displays the contents of **/etc/issue** and issues the initial login prompt. When the user types a login name, **getty** invokes the **login** program which prompts for the user's password.

### /etc/gettydefs

The **gettydefs** file consists of records (see figure 1) which define port parameters and login prompt. Records are separated by a blank line. Each record is organized as follows:

*Label # port parameters prior to login # port parameters after login # login prompt # next label*

Records can span multiple lines and may look like:

*Label # port parameters prior to login*
*# port parameters after login*
*# login prompt*
*# next label*

The **#** does NOT represent a comment as it would in a shell command script. It is simply a field separator for the record. This sometimes confuses new administrators.

The label field is an alphanumeric label from the **getty** command line. While the number 9600 typically represents 9600 baud, other label names such as local, TERMS, Local96 might also mean the same thing. While it may be confusing, the 9600 entry might be a label pointing to a 2400-baud entry. The label is simply a pointer to the information for **getty**. As it turns out, in HP-UX, the label **H**, rather than the label **9600** should be used for 9600-baud hardwired terminals.

What follows are the terminal settings that **getty** should set up prior to login. A typical entry might be:

**FIGURE 1** *Typical getty entry*

```
1200   #B1200 HUPCL IGNPAR PARENB ICRNL IXON OPOST ONLCR CS7 CREAD
            ISIG ICANON ECHO ECHOK PARENB ISTRIP IXANY TAB3 SANE
       #B1200 SANE CS7 PARENB ISTRIP IXANY TAB3
       #login: #2400
```

```
B9600 HUPCL CS7 PARENB HUPCL ISTRIP IXANY TAB3 SANE
```

The different parameters are discussed in the **man** pages for **stty** so I will not go into detail on them now, but a few used in the other entries are significant for this article.

**CS7** — means that the port is set to use seven-bit data transfer. This is the HP default for all but the **H** and **console** entries.

**PARENB** — means that parity checking is enabled.

**HUPCL** — tells **getty** to send a hang-up signal to the port when it is closed. For modems, this will request the modem to disconnect. For hardwired ports, this has no effect.

**B9600** — this is the parameter that sets the actual baud rate for the port.

The lack of a **PARODD** parameter means that even parity is set. To use 8 bit with no parity, change the **CS7** to **CS8** and remove the **PARENB**.

The next field contains the parameters to be set after login. Make sure that the parameters for baud rate, parity and number of data bits agree with the parameters used for the pre-login settings or unexpected results may occur.

The following field is the login prompt field. While this generally is **login**:, it may be changed. For example, the console entry has the prompt **Console login**: as its default.

The last field is the label field that **getty** should use if the **break**[3] key is pressed prior to login. For the **console**, **19200** and **H** entries, this is set to loop back to itself, which inhibits changing baud rates. For the others, they are set to cycle through baud rates from 300 to 9600 starting at the value specified by the appropriate label. This is useful for modems where a user might connect at other than the initial speed. In this case, depressing the **break** key until a readable login: prompt is seen means that **getty** has now set the port to the same speed the user is using. For hardwired ports, this can cause problems. Accidentally powering off a hardwired terminal will result in sending a **break** signal. The next time you power it back on, you will have to hit the **break** key until **getty** responds at the right baud rate.

If you wish to change entries from the defaults provided by HP, I would recommend you add new entries rather than modifying existing ones. Figure 2 shows an example of an entry for a directly connected 19200-baud terminal and one for a modem which is limited to the speeds 9600 and 19200.

One very important act is to check your **gettydefs** file. This can be done by executing **/etc/getty -c gettydefs**.

**FIGURE 2** *New gettydefs entries and sample inittab entries*

```
M9600 #B9600 HUPCL SANE CS8 ISTRIP IXANY TAB3
      #B9600 HUPCL SANE CS8 ISTRIP IXANY TAB3
      #login: #M19

M19   #B19200 HUPCL SANE CS8 ISTRIP IXANY TAB3
      #B19200 HUPCL SANE CS8 ISTRIP IXANY TAB3
      #login: #M9600

H19   #B19200 HUPCL SANE CS8 ISTRIP IXANY TAB3
      #B19200 HUPCL SANE CS8 ISTRIP IXANY TAB3
      #login: #H19


tty1:2:respawn:/etc/getty -h tty3p2 H19
tty2:2:respawn:/etc/getty -h ttyd3p3 M9600
```

## MODEM CONTROL

When **getty** is used with modems, you must remember to set up the port as a dial-in device rather than a hardwired one. Dial-in devices should have the name *ttydxxx* rather than *ttyxxx*. While this is not an absolute necessity, it has become "standard" to define modem ports in this manner.

When **getty** is used with dial-in devices, it will raise the Data Terminal Ready[4] (DTR)[5] signal to the modem to indicate that the computer is able to accept a connection. The **getty** waits on the port in a "partially open"[6] state allowing the port still to be used for outgoing traffic such as **kermit**, **cu** or **uucp** (bidirectional port)[7]. When a user dials in, the modem should be set to indicate that it has received a carrier from the user's modem by raising its carrier detect (CD) signal.

The presence of this signal causes the **getty** to make full connection with the port unless the port is in use with an outgoing program. When the user logs off, the DTR signal will drop (unless you forgot to put **HUPCL** in the gettydefs entry), telling the modem to disconnect. If a connection is made and the user is running a shell or other program and all these programs terminate abnormally, the user will also be disconnected. Similarly, if the user's telephone connection is abnormally terminated by disconnecting without logging off or by modem problems, the modem will drop CD and the system will abort the user's programs, effectively logging them off.

On some UNIX systems, you must use **uugetty** for bidirectional ports. **Uugetty** is not required on HP-UX systems except for bidirectional hardwired ports. Port contention is controlled by prioritizing requests, with connection requests to the hardwired device being highest, followed by dial-out[8] then dial-in. So if **getty** is waiting on a modem device in a "partially open" state and a dial-out connection is desired, the dial-out will open the device. When the modem asserts CD, the dial-out will see and respond to the signal and the **getty** will not make a connection, thus avoiding interference.

## TESTING A PORT

Some simple tests can be done to verify ports. The following is only a simplified list which demonstrate some of the things I have discussed in this article.

### Modem Getty Tests

For modem ports, you can test for the "partially open" state on a **getty** by executing **ps -ef | grep getty**. On the modem port when there is no connection established, you will see a **?** in the tty column of the **ps** output. If you observe the *ttydxxx* port name, you either are not using a modem port, have the wrong cable, or have the modem misconfigured.

Once a connection is made, and even before you log in, the **getty** entry will change from the **?** to the port name. At this point, the **getty** is fully connected and any attempt to use the direct or dial-out device will result in a busy return from the system to the program attempting to acquire the port.

Some simple tests that can be run are:

**1.** Kill the **getty** when there is no connection and observe the DTR light on the modem. It should momentarily go off, then come back as the **getty** is restarted by **init**.

**2.** When a connection is made and a user is logged in with the shell prompt, kill the user's shell. You should see the DTR light drop as above and the user should be automatically logged off.

**3.** When a new connection is made and a user is logged in with the shell prompt, have the user hang up his modem without logging off or just simply disconnect the phone jack from the modem. You should observe the CD light going off, followed by the DTR light, and the user should be automatically logged off the system.

Failures of any of these tests are most likely caused by using the wrong cable, modem settings not being correct, not using a modem port, not using HUPCL, or a program or script trapping the hang-up signal from the system.

### Baud Rate and Parity Tests

Some simple observations can tell you if you have the wrong baud rate or parity. If you see characters that look somewhat recognizable like

loÓiŸ:

instead of

**login:**

you most likely have a parity rather than a baud rate problem. On the other hand, if the output is totally unrecognizable but is about the right length, you probably are running at the wrong baud rate. Try hitting the **break** key until you see a proper login prompt. If the port is set up not to change baud rates, the garbage displayed will probably repeat exactly the same each time you hit the **break** key.

### Post Login Test

After logging in, if you think the parity setting is wrong or you want to find out what baud rate you are using, type **stty -a**. This will show the same parameters used in **gettydefs** except that they will be in lower case. ◧

---

*John A. Pezzano is an HP Response Center Engineer in Atlanta, Georgia. Before moving to Atlanta, he spent seven years as an SE in the HP office in El Paso, Texas, supporting HP-UX systems.*

[1] In this text, I have used **bold** to indicate actual program, parameter or file names or for actual displayed information. I have used *italics* to indicate that the information represents an item rather than the item itself.

[2] I define hardwired ports to mean those ports directly connected to terminals, data multiplexers, or modems which do not utilize any signal lines other than the RS-232 pins 2 and 3.

[3] On personal computers using terminal emulators, the user is usually required to use some other key or combination of keys to send a **break**. A **break** is not a character but is a 200ms space.

[4] The modem control signals described here are accurate only where CCITT is not used on the port. In the United States, CCITT is not used and it should not be enabled. CCITT is enabled by setting an appropriate bit when setting up the port for modem control.

[5] DTR usually is indicated on the modem by a light labelled **TR**. Not all modems have lights.

[6] This is my name for this condition. It is also called "open pending". It means that the "open" request blocks waiting for CD.

[7] Bi-directional indicates that the port can be used for dial out or hardwired outgoing connection when there is no active incoming connection.

[8] The dial-out device is usually designated culxxx. There may be another device file, cuaxxx, which is the autodial device, a holdover from modems used years ago where you had to provide modem commands on one line (the cuaxxx) and connected to the remote end on another (the culxxx). The cuaxxx device file should be set to a hardwired device.

# lrom Color Resources

*by*
*Bill Hassell*

Several people have been asking about the color resources for lrom versus laserrom. In the classic laserrom, there were some 15-20 different color resources that could be specified either in the /usr/lib/X11/app-defaults/ LAserrom file, locally in .xrdb or the .Xdefaults files, or at runtime with the -xrm option.

lrom has only a handful listed yet there are many, many colors used that are not accounted for in the man pages or the LRom file. The most obvious color definition not found is the background for text windows such as the Library screen or the Reader window. The X resource for -bg or -background controls the frame around these boxes but the background behind the manual lists (Library window) is darker than the background color.

The secret is that many of the undefined colors are developed from the primary color, that is, the font background is a slightly dimmed version of the LRom* background resource. This is in accordance with current Motif programming style so there is no resource to control the font background.

Should the color not be available (because the display has run out of colors), the result will be black for a dimmed resource. Thus, if you see lrom come up normally but the Library screen has the text for the manuals on a black background, lrom was refused a color allocation request (i.e., the old error: Could not allocate color xxxx) by the display so it reverts to black.

The solution: get more memory planes for your display, or figure out what colors can be consolidated for the current set of applications. This most often is a problem with 6-plane (64 color) displays that are on older workstations.

### Super-Drive CD-ROM Player

The gauntlet was thrown down as NEC released its double-speed CD-ROM drive, rotating at twice the 'standard' speed for CDs. Now Pioneer has announced a quadruple speed CD player, and it's a 6 CD changer too!

The new DRM-604X has a SCSI interface, transferring sequential data from the drive at 600 MB/sec, four times the normal speed of 150 KB/sec. As mentioned in previous articles, the 150-KB limit is imposed by the audio CD heritage that CD-ROM discs share. Normally, one would assume that simply spinning the disc faster would be an easy solution.

The problem lies with multimedia, particularly interleaved sound where the sound is recorded in standard CD format. Rotating at high speed will cause a typical Alvin and the Chipmunks type of audio. By using large buffers and quick drive motors, the disc speed may be adjusted quickly, thus keeping the high speed transfer rate for ROM data and the audio still intact. However, most CD-ROM applications are currently data-only, so audio (which can't be shared) is not much of an issue.

As previously reported, CD-ROM changers have been difficult to roll into multi-user situations, primarily because of the thrashing that can occur as multiple users attempt to read multiple discs. Change time was measured in 10-15 range, which made the problem even worse.

However, the new Pioneer now changes discs in only 5 seconds, and coupled with the high-speed transfer rates, this product looks very attractive in terms of a multi-user disc system.

### lrom Bug for HP-UX 9.0

This is to alert you that there is an intermittent lrom crash when running on

9.0 systems, the symptom is:

From Reader window, select Library, double click to open a different book. The Reader window display does NOT get updated with the new book. After several tries, lrom may terminate abnormally.

The workaround is: Close the Reader Window(current book), then select another book to open.

This problem has been fixed and will be rolled out in the next lrom patch release.

### True Blue Lasers in the Future

Who would have thought that 600 megs isn't enough? Well, as the cost to reproduce and distribute massive quantities of data continues down with the popularity of the CD-ROM, it's no surprise that someone is looking at increasing the data density for future CDs.

Current CDs (audio or CD-ROM) use red beam lasers to read the data and the traditional 74 minutes of audio or 600 megs of data has not changed since the late 70s, when CDs were first invented. Sony labs have been experimenting with a blue beam laser semiconductor that may some day allow audio discs up to 3 1/2 hours on the standard 5-inch CD or 1700 megs of data on the CD-ROM.

Don't hold your breath yet...the laser must be cooled with a liquid nitrogen bath before it turns on, so these new long play CDs are several years away for the consumer's market.

### Custom CDROMs for Less Than $300!

Costs of up to $1,000 to master a single CD-ROM have been common for the last year or so, but a recent ad in *PC magazine* from Isomedia (Redmond, WA) shows that it can be done for $269 for one disc. Just get your data onto tape and get your CD-ROM back in 3 business days.

No details about the format requirements (i.e., cdfs format or just a DOS file system). For more information, call (206) 869-5411.

### Low Cost CD-ROM Titles

Walnut Creek CD-ROM is offering large collections of programs, source code, even pictures for as little as $25 each. Titles are:

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- CD-ROM caddies (probably Toshiba style) for $4.95 each. Call the distributor at (510) 947-5996.

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For only $99, you can get over $5,000 worth of maps on a disc. Street Atlas USA uses XMap software to provide seamless maps for every state, locating the exact map by zip code, phone number, street or place. The control panel allows positioning the map, zooming in/out, even clipping the image for printing. The program requires 3.x Windows with standard VGA display. From DeLorme Mapping, (207) 865-1234.

### PhotoCD Update

Here is a summary of a list prepared by Kodak on CD-ROM drives that have been tested by Kodak for compatibility with PhotoCD. As usual, these are non-Kodak products so continued compatibility is not guaranteed nor is compatibility guaranteed with every platform.

| VENDOR | MODEL AND NOTES |
|---|---|
| **Phillips/ Magnavox** | CDD461 with driver 1.03 or later |
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| **NEC** | CDR-73 or CDR-37 and NEC SCSI controller with NECCDR.SYS dated later than 4-92.<br>Note: the new CDR-74 or CDR-84 multispin drives do not work at this time. |
| **CD Rom, Inc.** | CRI 1000i plus<br>Trantor T128 or T130 SCSI controller PCA<br>Trantor driver rev 1.46d or later |
| **Texel** | DM3024 (internal) or DM5024 (external) plus<br>Trantor T128 or T130 SCSI controller PCA<br>Trantor driver rev 1.46d or later |
| **Toshiba** | TXM3301B (internal) or TXM3301E1 (external) plus<br>Trantor T128 or T130 SCSI controller PCA<br>Trantor driver rev 1.46d or later |

The Toshiba 3301 drives are the same as HP's A1999A or C2226A drives. However, there is no support software currently available for HP-UX platforms. The PhotoCD discs do not have a standard CD-ROM file system, which means they won't mount under HP-UX. ◧

*Bill Hassell, HP-UX System Support, HP Atlanta Response Center, e-mail: blh@hpuerca.atl.hp.com*

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CIRCLE 25 ON READER CARD

# Wcl, an X Programmer's Tool

*by*
*Larry Headlund*

Designing and coding Graphical User Interfaces (GUIs) is not the easiest task in the world, particularly in X's "native" C. I say that C is the native language for X because X itself is written in C, and at this time most of the examples you will have to look at are also in C. Even after you make the paradigm switch to event driven-programming and understand what you can and cannot do, the process of programing itself presents some new difficulties. These include:

- Graphical programs require rapid prototype development to get meaningful user input into the software development spiral.
- Graphical programs must expect to be customized by the user.
- Graphical programming with the toolkits (Xt, Athena, Motif) is hard, with a level of detail required some have compared to programming in assembly language.

These challenges have evoked a number of responses.

## Better Toolkits

Here toolkits refers to a library that sits above the basic Xlib interface and simplifies development. Xt, Motif and OpenLook are the most famous examples of these. Other toolkits either compete with these or build on them (or both) to provide easier development. These other toolkits may also offer platform independence, with the same code running under some combination of Motif, OpenLook, Microsoft Windows, Macintosh, character terminals, etc. Commercial products like this include XVT, JAM, Neuron Data, etc. One noncommercial example is stdwin by Guido van Rossum, which runs on alphanumeric terminals, X, Macintosh, MS-DOS with a dumb display, and the Atari.

The cross-platform toolkits are on the horns of the following dilemma: If they offer only the features with equivalents on all supported platforms, the "greatest common denominator" approach, then they cannot take advantage of the features of the more powerful platforms. If they emulate the more powerful features on the lesser platforms, they are shouldering a large development burden and risk becoming nonstandard (very Politically Incorrect for user interfaces) as the platforms evolve.

When you choose a toolkit, you are getting married to it. Even when the toolkit permits you to bypass it and work with the native toolkit, your infidelity will damage the advantages of the relationship.

## Non C Interfaces

It is not written in stone that X programming be done in C. An existing language with advantages over C, or just with greater familiarity to its adherents, can be substituted. Perhaps the best known of the non-C packages is Interviews for C++. Other interesting interfaces include Winterp, an xlisp interface to Motif, Elk, a Scheme interface to several toolkits, ezd, another Scheme interface, wsh, a ksh interface, Python, a "new" language with an interface to the widget-set-independent toolkit stdwin, and GNU Smalltalk with an X interface. This is by no means an exhaustive list. Note that most of the examples mentioned above are interpreted languages, with the advantages and problems of same.

A popular combination of toolkit and new language is Tk, an X interface with its own "look and feel" based on the TCL language. Tk is not built on Motif, but projects built with it look a lot like Motif to the user.

The question is, is it worthwhile to

learn a new language just to do GUI programming? Integration of existing code, for example for data base access, may be a problem.

Most of these languages have methods for adding C hooks but a heterogeneous environment may be a problem for you. Some say the paradigm shift to GUI programming is an excellent opportunity to expand your vision with a new language. Others argue that this is one strangeness to many. If you have a large investment in C tools or if your organization has standardized on C, switching languages may be difficult.

If you already use one of the above languages, don't stop reading now! Wcl is not chained to C.

### Specialized Languages

In the tradition of 4GLs (Fourth Generation Languages) developed for database access, some specialized languages for GUIs have been developed. These aim to abstract the essential functions of GUIs and have the programmer deal with the interface at a higher level. Some of these languages are interesting in their own right, although too many commercial 4GLs have strained mightily only to deliver an inferior rewrite of COBOL. For that matter, many of the arguments for 4GLs (Plain English! Nonprogrammers develop applications! So simple even management can do it!) are the same ones that were advanced for COBOL. This is not to run down COBOL, which has proved very useful and is still evolving, but to criticize the wannabees.

Specialized languages face the same arguments advanced against the not-your-standard languages above. Also, C, C++, Scheme, Lisp, etc. have acquired supporting tools, libraries, example code, working programs, introductory and advanced textbooks, and the other accoutrements of well-understood languages, which are not lightly discarded.

### WYSIWYG Design Tools

What You See Is What You Get design tools replace the coding of the appearance of an application with drawing. Typically you design an interface by choosing from a palette of interface elements and positioning it directly on the screen. The WYSIWYG may generate a C program, an app-defaults file, a specially formatted interface specification file, or some combination of the above. The designer gets immediate feedback on his design, and this technique is much faster in developing an interface than straight coding. WYSIWYG tools are available for or bundled with many specialized languages and custom toolkits.

The disadvantage of WYSIWYG programming is What You See Is All You Get. That is, if the object you want to use is not on the palette, you can't use it from inside the tool. Some designing tools let you add new objects, with greater or lesser difficulties. Usually you don't have full access to the toolkit from within the tool. That is, there are some things you can do easily from within the toolkit that you can't do using the tool. The example I always try is creating a selection dialogue with the list unmanaged. I haven't run into any WYSIWYG tools that can do this. It may not be possible with some tools to add your own or new widgets.

If the WYSIWYG tool generates its own specification interface file in its own format, you will need an interpreting engine on each target platform. This may be expensive or unavailable for the particular platform you are interested in.

If the WYSIWYG tool generates C code, it may not be structured to match your standards, in all senses of the word standards. It may not allow you to modify the generated code and then have the tool work with the modified code as part of the development spiral.

If the tool generates an intermediate language, then the objections to yet another language and the possible problems of generated C code both apply.

### Wcl, the Widget Creation Library

I would like to be able to say that Wcl gives you all the advantages of any of the above approaches with none of the disadvantages. I can't, but it is a damn good tool anyway.

Wcl extends the functionality of the X resource file to include not only the appearance of existing widgets but the creation of widgets, their type, and the binding of callbacks. With the exception of the callbacks themselves, the entire application may be specified inside of Wcl. Wcl is widget-set-independent. It works with and examples are provided for Motif, Athena, and OpenLook.

Wcl is language independent. It is written in C and perhaps that is the most "natural" way to use it, but interfaces have already been written to it with C++ and Tcl, with strong rumors of Perl and Scheme interfaces upcoming.

Wcl is popular. This means that there are lots programs using it and that when, for example, Bellcore released their Xbae spreadsheet widget, they included interfaces and sample programs using Wcl. There is even a WYSIWYG tool called Dirt by Richart Hesketh, which generates Wcl resource files.

Wcl is efficient enough and has low enough overhead that the prototype written with it can be the finished application.

Wcl is not a complete language. It does not have branching or loop constructs, for

example. You would have to code your callbacks in another language. It does include sample callbacks, which allow you, for example, to execute a shell command, such as starting another program.

Wcl is available in the MIT X contrib and the other usual anon ftp sites.

### To Be Continued

Next time I will go into detail about how to use Wcl and its many advantages. If I've aroused your interest enough so that you want get it off the 'net and try it, this warning: If you are running HP-UX 8.x on a 4xx or 3xx with Motif1.1 and X11R4 from HP, versions of Wcl above 1.04 may dump core when using the Motif libraries. Wcl 2.xx requires X11R5 for its template functionality. It may well dump core with the Motif widgets. Wcl 2.x runs fine with X11R5 and the Athena Widgets under 8.0.

So if you are in the following environment:

```
9000/3xx or 9000/4xx
HP-UX 8.x
X11R4 from HP
Motif1.1 from HP
```

get Wcl 1.04. The features of Wcl 2.x are very nice, but 1.04 is a useful tool on its own.

The code referenced below is available from export.lcs.mit.edu in the contrib directory.

**REFERENCES**


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**CIRCLE 11 ON READER CARD**

# Happiness Is... A Secure Computer

*by*
*R. Arthur Gentry*

Most users new to the UNIX world find it confusing and complicated, and one of the most overlooked items is system security. This column will outline some of the simplest, yet most overlooked, procedures that help make a UNIX system more secure.

**1.** If your system is not in a secured environment, then stop reading here. No amount of software security will be able to stop a physical invasion of the system. Multi-user computer systems should be in a secured and controlled environment. How secured?

The answer to that is, how much risk are you willing to accept, and what is the cost to your business should the data stored on your systems be compromised? It can range from something as simple as a key-locked room (properly air-conditioned, of course) to retina and voice print identifiers with armed guards. Again, you need to balance the cost of providing physical security against the cost of lost, altered, or stolen company data.

**2.** Immediately upon acceptance of a computer system from a vendor (or now, if you haven't already), change all of the passwords in /etc/passwd. Id's that are needed for system reasons but are not needed as actual logins should have their passwords disabled by replacing the encrypted password string with something like NONE, NOWAY, *, NP or the like. Id's such as powerdown, bin, sys, setup and others should be disabled.

**3.** Invoke password aging for ALL logins except root, uucp, and nuucp, which should be changed manually on a regular basis. Password aging is invoked by placing a "," (comma) and a pair of codes following the encrypted password. The /etc/passwd entry would look something like this:

```
ed:i3osSjf8/dSx,A/:101:1:Ed Smith:/usr/ed:/bin/ksh
```

The code A/ tells the login process that this password must be changed every 12 weeks (A) and that it can only be changed once a week (/).

In a system that has implemented the /etc/shadow file format, the entry would look like this:

```
ed:i3osSjf8/dSx,7820:7:60
```

Field #1 is the user's id, #2 is the encrypted password, #3 is the last date the password was changed (in days since January, 1970), #4 is the minimum number of days the password must be in effect before being changed again, and #5 is the number of days this password can remain in effect. The password entry in the /etc/passwd file is replaced with an asterisk (*).

The time permitted between required password changes should be long enough to not aggravate users yet should provide necessary security for the system. Suggested guidelines allow one month for logins with access to restricted data, two months for sensitive data, and three months for noncritical applications.

**4.** Verify that the file permissions for /etc/passwd are read only (i.e., r--r--r--) and that the file is owned by root.

**5.** While on the subject of logins and passwords, don't forget to look over the Systems and Permissions files in /usr/lib/uucp.

To start off, both of these files should have read permission only for the owner (i.e., r--------), and both files should be owned by uucp.

**6.** Systems entered in your Systems file should be verified on a regular basis for accuracy and necessity. Delete any entries that are no longer needed, and verify that the system you think you are calling really is the system you are calling!
**7.** Regularly change the passwords for your uucp and/or nuucp logins. This means talking (yes, TALKING, do NOT e-mail passwords!) to the remote system administrator, so he or she can change the password in their Systems file.
**8.** One of the most common security problems I encounter in UNIX systems is in the Permissions file. Most people leave in the default entries, which generally allow a system to initiate a uucp file transfer to your system to read or write any file that has world read/write permission. For example, a system could come in and take a copy of your /etc/passwd file, since the file has world read permission. To prevent this, use the NOREAD, READ, and WRITE variables in the Permissions file. A typical entry might be the following:

```
NOREAD=/etc:/usr/lib/uucp \
WRITE=/usr/spool/uucppublic
```

These entries will allow systems to read any file that has world read permission, from any directory on your system, except /etc and /usr/lib/uucp; and to write files only into the directory /usr/lib/uucppublic. You can, of course, restrict the access even more by specifying additional directories in the NOREAD variable or by setting the READ variable to only those directories that you want read from.
**9.** File permissions are another area most people don't think twice about. A good rule of thumb is there should be no files on the system with world write permission, with the exception of tmp files. Any file that has world write permission can be modified or deleted by anyone. User-owned files should have read, write, and execute (if appropriate) for the owner, with group and world permissions set as needed. One way to set this by default is by using the umask command in /etc/profile. This command works as a binary or against file permissions of 777, or read, write, and execute for everyone. By setting umask to 027, default file permissions are now 750, or read, write, execute for owner, read and execute for group, and nothing for world.
**10.** Check directory ownerships and permissions. Root should own all file systems, with file permissions set to 775. Group ownership should be set by the file system type, i.e., bin should be the group owner of /bin, sys should be the group owner of /etc and so on. Individual user directories should be owned by the user, with permissions set for 755 or tighter.
**11.** Individual user "." (dot) files, such as .profile, should have read and write permission to the owner only. This prevents someone from possibly sticking a Trojan horse program into a user's file. Be careful when changing ownerships of the root user dot files; issuing the command `chown user .*` will also change the ownerships of the parent directories.
**12.** Invoke a method of forcing inactive users to log off the system. Many a time I have wandered through an office and seen unattended terminals logged into applications. There are several ways to activate automatic log off, depending on your vendor's software capabilities. You can also write a script that will scan for inactivity and force a user off. This script should be placed in root's crontab entries to run every 30 minutes or so. Scripts for doing this can be found in most UNIX system administration publications.
**13.** Immediately deactivate any logins of employees who leave the company. The easiest way to do this, without losing any data that may be in their directories, is to replace the encrypted password entry with the word NONE.
**14.** Each time you install an operating system update, or upon an initial installation, create a list of known programs that have been suid to root. The easiest way to do this is with the find command.

The command

```
find / -perm -4000 -user root -exec ls -al {} \;
```

will give you a list of all files on your system that will run as root, no matter who runs them. This list should be compared against a known good list on a regular basis. Any program that is not known to be needed as being suid to root should immediately be suspect and investigated. More Trojan horse programs are created this way than any other. At the same time, verify the last modification date and file size with your known good list. It is very common for someone to modify a normal system utility so that it does a not-so-normal function.
**15.** Another easy-to-implement security measure is to force screen clearing at log-off time, preventing a user from leaving possibly proprietary information on the screen when they log off.

Screen clearing is easily accomplished using the trap command in /etc/profile. The command `trap "`tput clear`" 0 1` will clear the screen whenever the user exits the shell or sends a hang-up signal to his process. This assumes that the user has properly defined his terminal type at login time.

**16.** Probably the most important security measure, and the most misunderstood by users, is backups. As a system administrator, your most important job is to assure that adequate backups exist for all your systems. I have yet to meet an administrator who hasn't thought they could get away with not doing backups one time and paid for it dearly later.

Besides having a good set of backups on-site, it is important to keep a current set off-site as well; if your computer site goes up in flames, doing backups regularly will do no good if all the sets are in the same place. Ensure that the off-site set is secure from unauthorized personnel.

**17.** Another place to check file permissions and ownerships is /usr/spool/cron/crontabs. All files in this directory should be read only to the owner. Also, pay close attention to entries in crontabs files root, sys, sysadm, and bin. When these cron jobs execute, they run as the owner, which means that any job that runs from root's file has root's permissions.

This elementary description provides some simple suggestions for making your systems more secure. This list could go on another 20 pages, addressing problems associated with networks, databases, dial-in modems, X.25 networks, and so on. The solutions can also go on, depending on the capabilities and uses of your systems; some system vendors have implemented CI2 security measures that, if taken full advantage of, will make your system quite secure, plus give you the ability to audit users' actions.

The real keys to system security are in the hands of you, the system administrator. User education, a watchful eye, and common sense will prevent most amateur intrusions. But don't forget the number-one rule of security—the only totally secure system has no terminals, modems or printers on it. In a normal environment, there is no such thing as a totally secure system, only systems that are more secure than others. ◧

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# HP-UX Security Issues & Controls

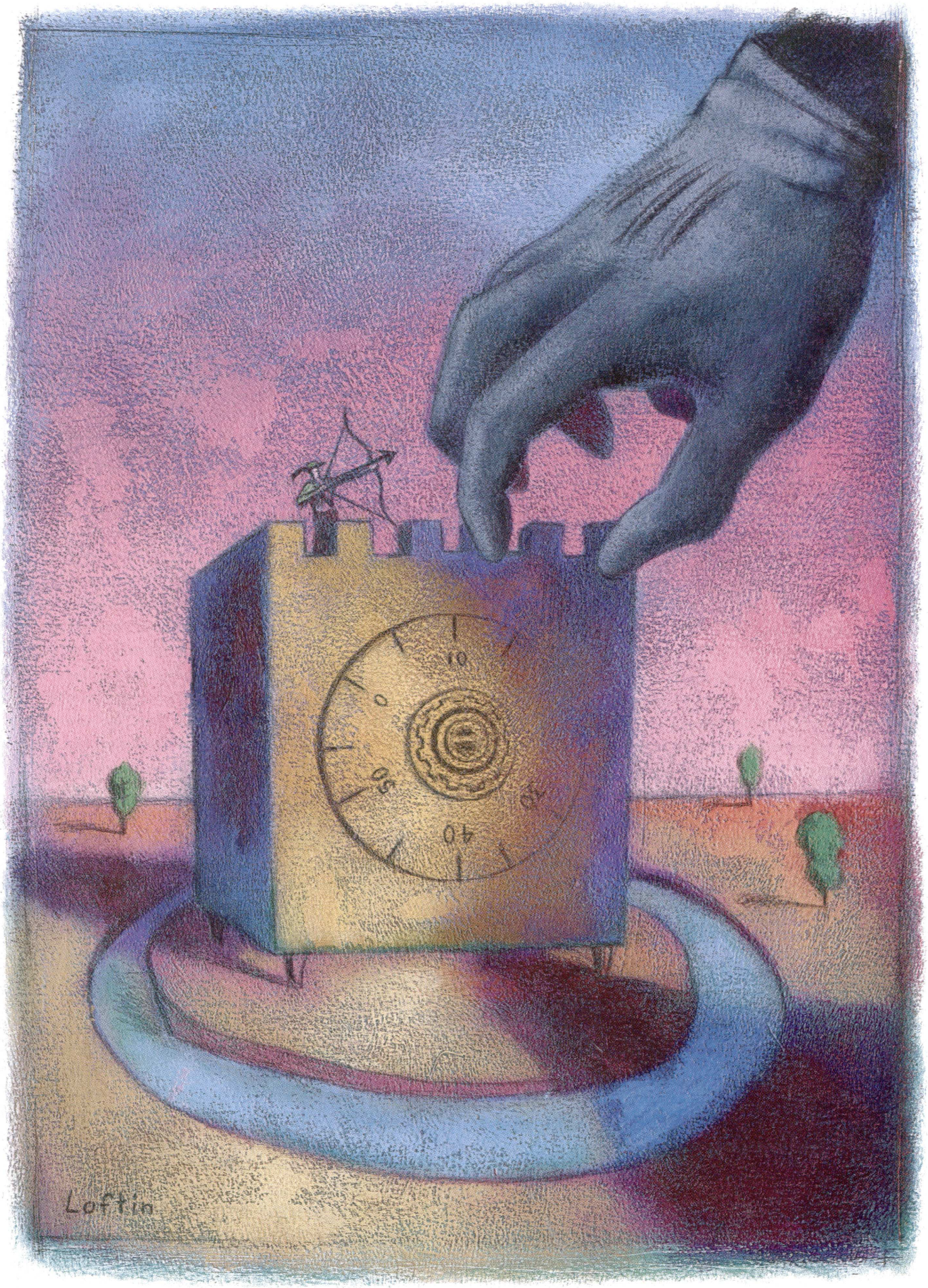
**Maintaining a Secure Environment Requires The Full Commitment Of All Involved**

*by Chris Hauck*

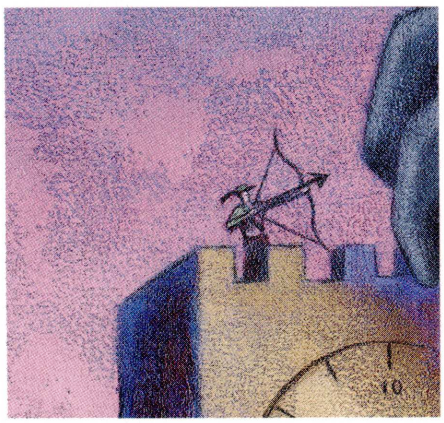
As HP-UX systems are moving into the mainstream commercial data processing environment at an accelerating rate, more and more mission-critical applications are running on HP 9000 systems. These applications and related databases of information have become one of the most valuable and non-replaceable assets for many corporations. As with all other company assets, protecting the integrity and privacy of this information is, or should be, of paramount concern.

Very often security is an afterthought when we are installing or maintaining a system. The key to successfully maintaining a secure system is to begin with an understanding of the key issues facing the security/system manager and the available means of securing the system. Only then can an adequate, effective security plan be developed and implemented; otherwise it's like trying to hit a moving target in the dark.

ILLUSTRATION BY BRAD LOFTIN


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This article begins with a discussion of general commercial security requirements, outlining the concerns and issues facing most security and system administrators today. These issues are then discussed as they relate specifically to the HP-UX environment, with a presentation of available security controls, monitoring tools, and potential areas of vulnerability. With a number of shops now operating in a mixed MPE and HP-UX environment, this article also relates HP-UX security controls and concepts to the MPE/iX operating environment.



## Introduction

System security planning is very similar to an insurance policy; until something is lost, stolen or damaged, it is just a costly expense and an inconvenience for an organization. Often overlooked during system implementation and planning, system security is typically implemented haphazardly at best. Initial efforts at securing a system become ineffective after on-going system maintenance and management activities are performed. Controls and security measures implemented in the past do not keep pace or are not updated to accommodate newer applications, network connections and client-server implementations. This often leaves gaping holes in the security of the systems, holes which could cost an organization a considerable amount of money due to loss of data (through either malicious or accidental acts), and loss of business (through temporary loss of computing facilities), resulting in a general loss of credibility in the industry.

Security is a risk. And just like all risks encountered in doing business, the risks can be managed to avoid these potential security hazards. Implementation of procedure modifications, operational changes, and additional controls can assist in reducing these risks (as in managing any risk, the cost of avoidance must be weighed against the potential threat/consequence). The greater the value of the information being processed, the greater the need to implement controls to restrict access, monitor activity, and audit modifications. This involves a commitment by all levels of an organization, with a security plan detailing goals and policies set forth by the upper-level management. This security plan should:

- Identify the goals and objectives of implementing security policies and procedures
- Detail the current operating environment (hardware, software, data, networking, etc.) and value to the organization, identifying need for privacy and integrity
- Review existing security controls and policies
- Identify general security requirements, guidelines, and policies
- Identify areas of vulnerability and necessary controls to minimize the risk
- Establish an implementation schedule for additional controls and on-going audit procedures; assign responsibilities for information security along with accountability policies
- Identify necessary training programs for various groups within the organization

The UNIX operating system was developed at Bell Laboratories by programmers, for programmers. Security of the system and files was not a major concern since all access was either by an individual or by a local development team. UNIX has traditionally been utilized in this type of "open" atmosphere, with almost every user having access to any file or resource of the system. In addition, there has been quite a bit of information published about the internal workings of the operating system, networking capabilities, and potential security holes in the system. This widespread knowledge of the "bowels" of UNIX has contributed to its reputation as an insecure operating system. Outside of Bell Labs, UNIX became popular in many universities, and gradually during the past decade, UNIX-based systems have permeated mainstream commercial data processing environments. During this period of many years, countless new features and utilities have been added to the core operating environment. Included in these developments are features designed to enhance the security of the system and files; however, very often these facilities go unimplemented.

When the word "security" is mentioned, the term that frequently comes to mind is "hacker." The media have publicized a number of both fictional and real-life computer security breaches over the past few years, popularizing the hacker role in the movie *War Games*. Although these types of concentrated attacks to break the security of a system certainly exist (as evidenced by the 1988 Internet "worm," the 1986-87 international Internet computer break-ins, and the various viruses and Trojan horses), evidence suggests that the greatest potential threats lie within an organization: through current employees or ex-employees

attempting to access unauthorized information, lack of effective data backup procedures, or unintentional modification or destruction of data due to carelessness or lack of understanding.

In order to begin to understand the potential vulnerabilities of your system, it is worth considering the types of security "attacks" that may be waged. In a broad sense they can be categorized as either:

**1.** Attempting to access (logon) an unauthorized system or user id, or

**2.** Attempting to access (read/modify/execute) an unauthorized file, database or executable program.

### Controlling System Access

Keeping unwanted users from knowing about your system and logging on is more than half the battle in securing the system. Once an unauthorized user signs on, the possibilities for causing some type of damage greatly increase; therefore, it is at this point that a good portion of the effort involved in maintaining a secure system lies. With the development of sophisticated networking protocols and services, and the proliferation of systems attached to corporate, metropolitan, and global networks (such as the Internet), identifying a list of accessible systems has become a trivial task, even for the UNIX novice. Published lists of systems, including logons for non-privileged file transfer (FTP) access are widely available on nearly every bulletin board and even on the Internet systems themselves. Even if a system is not directly connected to the public networking environments, most multi-user business systems have some type of local area network or modem access available, and all have directly attached terminal or X-window devices. This minimizes the challenge for a potential intruder, and places the full burden of identifying permissible users of the system squarely on the shoulders of the security administrator(s) and/or system manager(s).

Prevention of a problem by restricting access is very often many times less costly than attempting to deal with the problem after the fact. Controlling access to the system's hardware, networking capabilities, and user ids is the first line of defense. Devices such as call-back modems, address filtering bridges and routers, and network service restrictions can assist in controlling who may access a system; however, this article will focus on the UNIX operating system level controls and security functionality available to the security administrator. Exploration of the security controls involved in a networked environment is beyond the scope of this system-level introduction. Very often, implementing a basic set of security provisions and policies along with continual monitoring for compliance will provide the greatest incremental improvement in overall system security and integrity.

With regard to controlling system access, these basic security provisions relate to:

- Password protection
- Default Accounts (user ids)
- Obsolete Accounts
- Login scripts

### Password Protection

In order to determine whether or not a person should be allowed access to a system, some method of identifying that person is required. Sophisticated techniques (such as retinal scans, voice prints, and finger prints) have been implemented to verify a person's identify, but these also have some limitations due to costs, complexity and today's distributed environments. Passwords remain a cost-effective, generally available, and if properly administered, fairly reliable means of identifying a user, based upon that person's knowledge. Also, combinations of passwords and "security cards" can further enhance the effectiveness of user identification and authentication.

With UNIX (and HP-UX, Hewlett-Packard's implementation of UNIX), user account information, including user name, user id, group id, password, comments, home directory and startup program are maintained by default in the file '/etc/passwd', formatted as follows:

```
$ more /etc/passwd
root:7v48qzZbiEhok:0:3::/:/bin/ksh
daemon:*:1:5::/:/bin/sh
bin:*:2:2::/bin:/bin/sh
adm:*:4:4::/usr/adm:/bin/sh
uucp:*:5:3::/usr/spool/uucppublic:/usr/lib/uucp/uucico
lp:*:9:7::/usr/spool/lp:/bin/sh
hpdb:*:27:1:ALLBASE:/:/bin/sh
tftp:*:77:10:TFTP daemon:/usr/tftpdir:/bin/false
ppluser:*:80:10:ppl user:/usr/tftpdir:/usr/bin/ppl
bsmith:rqSCr405ystZY:502:21:Bill Smith,555-1234,555-5678:
       /users/bsmith:/bin/sh
```

General format:

```
<username><encrypted password><user id><groupid><comments>
                        <HOME directory><startup program>
```

User id and Group id are numbers associated with a user at login time, based upon the supplied user name. The password is stored in the file using a one-way encryption algorithm. During the login process, after the user specifies a user name and password, the system performs a one-way encryption on the supplied password and verifies both the user name and encrypted password against the /etc/passwd file entries. If they match, the login process continues by executing any login 'scripts' (a sequence of operating system command interpreter or 'shell' commands stored in a file) defined by the system administrator and/or user. The user and group id's are used by the UNIX file system in establishing file-level access controls.

A special user id of zero (0) identifies the user as a "super-user" to the system. This is analogous to System Manager or SM capability in the MPE/iX operating system of the HP 3000 computer family. Unlike MPE, which allows specification of a "capability list" to users/groups/accounts, UNIX provides only two type of accounts: root (or super-user) and everything else. Super-users can access (read/write/execute/delete) any file in the file system. In an operating state known as a "trusted system," the super-user is also capable of maintaining the security and integrity of the system. The HP-UX operating system limits its execution of many system management commands to super-users (such as adding new users, removing users, establishing login startup scripts, kernel configuration/modification, etc).

A person attempting to gain illegitimate access to a UNIX-based computer system will likely attempt to gain super-user privileges. Once gained, the damage or access to confidential data is nearly limitless. The user name 'root' is similar to 'MANAGER.SYS' on the 3000, in that it is the user id with the most capability, and exists on every UNIX-based system. Consequently, access to the root password should be restricted to the minimum set of individuals, and changed frequently.

The 'root' user name is generic and does not uniquely identify an individual, especially if the logon password is known by more than one person. Therefore, the better method for gaining root access to the system is to have those individuals log in to the system using their unique non-root privilege user names, and using a UNIX facility called 'su', or switch user, to gain root privileges temporarily when necessary. su allows a logged-in user to switch to a new user id and group id without logging off and on again. If the current user id is non-zero (not root privileges), the person must specify the password of the requested user name. The advantage of using this technique versus directly logging on as 'root' is that the su command can optionally log into the file '/usr/adm/sulog' both successful and unsuccessful attempts to switch user (if the file exists within the system). This provides an audit trail for users gaining access to root or any other user id via the su command. The file /usr/adm/sulog contains the date/time, success or failure (+/-), terminal device, and original-destination user names, as shown below:

```
$ whoami
jshoe                          (our current user name)
$ su root                      (now switch to user 'root')
Password:
# more /usr/adm/sulog          (examine the su log file)
SU 04/20 09:41 +    ttyu0 msmith-root
SU 04/22 16:18 -    ttyp3 bmiller-root
SU 04/22 16:37 +    ttyu0 jshoe-root
                       (log of our su access to root)
```

By default, HP-UX passwords must be constructed to meet the following requirements:

- Each password must have at least six characters. Only the first eight characters are significant.
- Characters must be from the 7-bit USASCII character set; letters from the English alphabet.
- Each password must contain at least two alphabetic characters and at least one numeric or special character. In this case, "alphabetic" means uppercase and lowercase letters.
- Each password must differ from the user's login name and any reverse or circular shift of that login name. For comparison purposes, an uppercase letter and its corresponding lowercase equivalent are treated as identical.
- New passwords must differ from the old one by at least three characters. For comparison purposes, an uppercase letter and its corresponding lowercase equivalent are treated as identical.

The objective in choosing a password is to make it as difficult as possible to guess, while also making it meaningful enough for the user to remember without the need to write it down. Passwords must be kept secret at all times, since it is the limited knowledge of other users that allows us to identify uniquely a person requesting access to the system. Sharing user ids and passwords among a group of users should be avoided, if at all possible. Not only does sharing defeat the purpose of attempting to identify a user uniquely, and limit the effectiveness of activity audit trails, but the task of changing a password is much more difficult and often is a reason why some passwords are never changed, since all persons

sharing the password must be notified.

Password security is the responsibility of the security administrator and every user who has a valid user id on the system. At the time a user is added to the system, a password should be assigned by the system administrator. Every user should have a unique user id (uid) and should have the same uid assigned for each system for which he has a login id (this simplifies file access management in an environment utilizing NFS — Network File System). To verify that there are no duplicate user ids defined in the /etc/passwd file, perform the following:

```
$ sort -t: +2n /etc/passwd |\
> awk -F: '{if (duplicate == $3) print $1 " " uname; uname =
                                                        $1; \
> duplicate = $3}'
```

Under HP-UX, the individual user has the ability to change his or her own login password by using the 'passwd' command. After prompting for the current password, the system requests a new password twice, once for verification since the user's typing is not echoed to the display. The super-user is permitted to change any user password on the system, or can remove a password by simply pressing return when prompted for the new password.

Even though the passwords in the file are encrypted and not able to be decrypted, theoretically, someone who had access to the encryption algorithm used by the operating system and a list of the encrypted passwords from a system (simply a copy of the /etc/passwd file) could write a program to try many combinations of words in an attempt to find a matching encrypted password (in fact, this technique has been used to crack passwords on many systems). Even though there are a large number of combinations of the available letters and special characters, very often only a small subset is actually used — drastically decreasing the total number of possibilities. Since it is possible programmatically (using the standard utility /usr/lib/makekey) to test a large number of passwords against the encrypted passwords stored in the /etc/passwd file (such as all the words in the dictionary), here are some additional guidelines in choosing a password:

- Do not use any form of the words from the comment field portion of the /etc/passwd file.
- Do not use a spouse's or child's name.
- Do not use simple keyword sequences such as "1qwerty."
- Do not use other data easily obtained or known about you (such as nicknames, favorite foods, activities, sports, teams, characters, car models, etc).
- Do use a password with mixed upper and lower case letters.
- Passwords should never be stored as part of a file on the computer, either on the UNIX system or a PC terminal emulator application logon script.
- Do use a password that is easy to remember. Try misspelling words, or making nonsense words from multiple syllables. "Pass-phrases" are good — choosing the first letter from each word in a phrase, e.g., "All men are created equal" yields "Amace9".
- Force users to change their passwords on a regular basis.
- Every user id defined in /etc/passwd should have a password.
- Entries in /etc/passwd for place holder or no-user accounts should have an impossible password ("*"), and if possible a startup program of "/bin/false".

After making any changes to either the /etc/passwd or /etc/groups files, use the HP-UX utilities pwck and grpck to scan the files and report any inconsistencies. The checks include validation of the number of fields, login name, user ID, group ID, and whether the login directory and optional program name exist.

Password aging is put in effect for a particular user if his encrypted password in the password file is followed by a comma and a non-null string of characters. (Such a string must be introduced in the first instance by the super-user.) This string defines the "age" needed to implement password aging. The first character of the age — such as 'M' — denotes the maximum number of weeks for which a password is valid. A user who attempts to log in after his password has expired is forced to supply a new one. The next character — such as 'm' — denotes the minimum period in weeks that must expire before the password can be changed.

A second password file can also be established by the system administrator (/.secure/etc/passwd) to maintain the encrypted passwords on the system and prevent non-privileged users from viewing them. Unlike the /etc/passwd file, which is readable by all users of the system, /.secure/etc/passwd should be accessible to super-users only. The passwords contained in /.secure/etc/passwd take precedence over those contained in the encrypted password field of /etc/passwd. User authentication is done using the encrypted passwords in this file. The password aging mechanism described above also applies to /.secure/etc/passwd. Use of this secondary passwd file is established as part of converting to a "Trusted System."

### Default and Obsolete Accounts

On many systems, especially those with a large number of user ids defined, there typically exist a number of user ids that have been set up over the years for special purposes and are no longer of value. These may have been required by third-party software, a demonstration id for evaluation software, or for users to access games, etc. These accounts can very often be a large security hole in that either they have no passwords or easily guessable passwords. These types of accounts, if necessary, should only be created for a specified period of time and with a password that follows the conventions described above. Some accounts set up for use by the operating system should have impossible passwords set (by preceding the encrypted password with an '*', for example), including: (daemon, bin, adm, uucp, lp, hpdb, tftp and ppluser). These user names/ids are used by the various HP-UX subsystems to establish proper file access right sets for the files associated with the subsystem, but not for user logons.

Notification of the security administrator or system manager should be a part of the processing policy when an employee leaves the company. It is important to the security of the system(s) to remove all user ids associated with the employee and remove and/or archive their files. If the ex-employee had access to root privileges, all passwords on the system, including root, should be modified as soon as possible. Using third-party software or customized shell scripts, procedures can be implemented to remove all files associated with a user id and to check for accounts that have not been accessed for a period of time.

### Login Scripts

The first level of defense that the system administrator can use to protect the system is through the login process (user name and passwords). Login scripts provide another level of control during the sign-on process. Similar to "OPTION LOGON" UDCs on the HP 3000, login shell scripts are executed by the user's shell (command interpreter) before presenting the user with a prompt or initiating an application. As mentioned previously, the "shell" is the part of the UNIX operating system that processes the commands entered by a user. This is actually nothing more than a program with special capabilities, and over the years a number have been developed. The four primary shells provided by HP-UX are:

```
/bin/sh          "Bourne" shell
/bin/ksh         "Korn" shell
/bin/csh         "C" shell - with "C" language type syntax
/usr/bin/keysh   Function key driven shell, based on the ksh
```

In general, each of these shells has similar functionality, but commands and options are implemented differently. There are also versions of these shells known as "restricted" shells (typically denoted by the letter 'r' before the name, such as /bin/rksh). These restricted shells provide only a subset of the capabilities to the user; however, potential ways around some of the restrictions have been documented. These common shells use slightly different methods for processing login script files, although all have the ability to process two sets of scripts, one executed for all users logging on the system and another executed on a user-by-user basis (similar to a system-wide UDC and a user UDC on the HP 3000).

| SHELL | GLOBAL LOGIN SCRIPT | PER USER LOGIN SCRIPT |
|---|---|---|
| /bin/sh, /bin/ksh, /usr/bin/keysh | /etc/profile | $HOME/.profile |
| /bin/csh | /etc/csh.login | $HOME/.login |

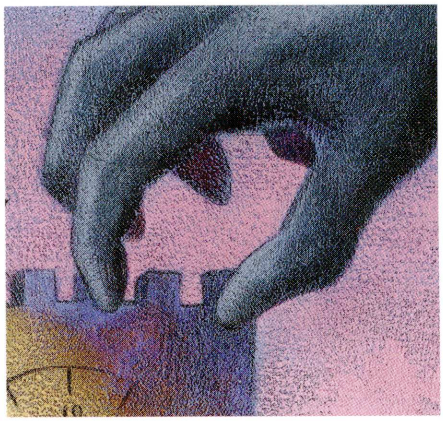
Standard actions performed by the global login scripts typically include:

- Setting the 'PATH' variable (similar to the PATH command in MS-DOS or the HPPATH variable in MPE/iX, which defines which subdirectories the shell will search for commands when processing user input)
- Setting the system name and time zone variables
- Configuring the type of terminal being used
- Displaying the copyright notices and any "Message of the Day" (/etc/copyright & /etc/motd)
- Checking if your user id has been sent any mail

In addition, this global script is a prime location for executing a second script that can provide additional access protection, such as prompting the user for additional passwords if the device is a modem, restricting access to certain user ids based upon time of day, day of week or device file. HP-UX also has a standard feature for providing additional security for dialup (or other tty) devices. Two files, /etc/dialups and /etc/d_passwd, can be used to force the user of specified devices to enter another password based upon the program name from /etc/passwd (the startup shell program name).

Two other shell initialization scripts, .cshrc and .kshrc, are processed each time a user executes either the csh or ksh shells.

These initialization scripts, processed after the login scripts (.profile, etc), are typically used to establish any global shell variables, editor defaults, etc. In a workstation or X terminal environment, a user can have multiple simultaneous shells executing, each performing different tasks. Since the login scripts are not executed each time the user requests another "terminal window," these initialization scripts allow the user to create a customized shell environment each time a new shell or window is created.



The root user startup script (i.e., '/.profile') has been a target for hackers, who try inserting commands into the file if the file permissions allow a non-privileged user write access. A common tactic is to have these added commands create what is known as a "setuid to root" copy of one of the standard shell program files in another location in the system, with execute permission for all users. This allows any user on the system who knows about the program to run effectively as if they were logged in as the root user (super-user), and gain full access to restricted commands and files as long as they are running under this setuid shell. In the next section, file access rights and setuid flags are discussed in greater detail.

It is important to note that shells are not the only programs on the system that execute scripts during initialization. Standard UNIX utilities such as vi, ex and emacs also allow processing of startup scripts. These files (.exrc for vi and ex, .emacs for emacs) could be particularly vulnerable since they are executed out of the current directory. For example, if the root user changes directories to another user's home directory to modify their '.profile' script using the standard vi editor, and that user has a .exrc file that creates a setuid to root copy of a shell program, the user could later access the shell copy to gain full access to the system.

### Controlling File and Resource Access

After a user has passed the login process and startup profiles, they will be executing the program file specified in the last field of the /etc/passwd file for their user name. If the user has logged-on illegitimately, at this point the major part of the work of breaking into a system is complete. The potential for finding some type of security loophole is much greater since the user is able to search the system for programs, scripts, profiles, or data that may provide them with information regarding systems on other networks, dialup information to other systems, or even the ability to acquire super-user privileges. Therefore, file-level access controls are crucial in establishing a secure operating environment. UNIX's file (and device) access rights are based upon three categories of users: owner (the "owning" user id of the file), the group (the "owning" group id of the file), and all others (world), and three types of access: read, write, and execute. Normally the "owner" of a file is the creating user (actually the user id and group id of the creating user), although this can be modified using the change owner (chown) and change group (chgrp) commands. These combinations provide a set of nine permissions associated with each file (and directory/device) on the system. This is similar to the MPE/iX file access rights available on a file (read, write, append, lock, execute), and the user classification (creator, group user, account librarian, group librarian, account user, etc.). The ls command can optionally display these permission rights for any file on the system, for example:

```
$ ls -l /
total 5628
drwx------   2 root   mail        24 Feb   1  12:15 Mail
-rwxr-xr-x   1 root   sys    1168403 Feb   4  20:07 SYSBCKUP
-r-xr-xr-x   1 bin    bin     299064 May  13   1991 SYSTEST
drwxr-xr-x   3 root   root      4096 Feb   3  18:57 bin
drwxr-xr-x  10 root   root      5120 Apr  20  08:55 dev
drwxr-xr-x  12 root   root      7168 May   4  10:49 etc
-rwxr-xr-x   1 root   sys    1168403 Feb   3  21:06 hp-ux
dr-xr-xr-x   3 bin    bin       1056 Apr  11   1991 lib
drwxrwxrwx  11 root   root      3072 May   6  23:08 tmp
dr-xr-xr-x   8 bin    bin       1024 Mar  25  20:22 users
dr-xr-xr-x  30 bin    bin       1024 Feb  25  08:45 usr
```

The first section of this listing reflects each file's access rights. The first character identifies any special file attributes (i.e., d=directory, l=symbolic link, b=block device file, c=character device file, etc.), and the remaining nine characters are logically divided into groups of three characters, with each group represent-

ing the rights for the file owner, group member, and others, respectively. Within each character group, r, w, x represent read, write, and execute access. A dash (-) signifies that a specific type of access is disabled for that user classification. The third and fourth columns identify the file's "owner" user name and member group name. It is for this user and group that the "owner" and "group" file permission flags apply. File permissions can be changed on a file (assuming the user has access to the file) by using the chmod command. In addition, a file's contents can be encrypted using the crypt command. Although not too difficult for a serious hacker to decode, it can offer some additional level of security for some non-sensitive material against casual reading of a file's contents. However, encrypting files should not be used as a replacement for proper file permission settings.



With MPE, there exists a default set of file access rights based upon the group and account in which the file is created. With UNIX, file permissions for newly created files are controlled by two mechanisms. The first is the program or command that is actually creating the file. Different programs and subsystems supplied with UNIX create files with different default access rights. This could be a potential problem since some create the files with all access permissions enabled for all users. A second mechanism called umask (user mask) enables a user to define what the default file permissions should NOT allow. The umask command defines on a permission-by-permission basis (for all nine settings) which ones should be denied. A default user mask setting for strong security may be: 'umask 77', which means to deny all access other than for the file owner (and super-user). The user mask setting is often executed in the login profile script (profile or .login) and remains in effect as long as the shell is executing (normally until the user logs off).

In MPE there are additional discretionary access controls known as "Access Control Definitions." These ACDs allow a file creator to allow specific users (identified by name) specific access rights to a file or set of files. This same capability exists within HP-UX, with the Access Control Lists (ACLs). Using ACLs provides a method of specifying access rights for files in much greater detail then standard UNIX file permissions, and is a requirement for the DoD's C2 level of security. Like standard permissions, ACLs can be changed by using the chacl command and listed using the lsacl command. It is important to note that some standard UNIX commands do not understand ACLs and consequently may cause them to be silently removed (i.e., chmod without the -A option, cpset, tar, cpio, etc.). If ACLs are used, system backups should only be performed using the fbackup and frecover utilities, since only these programs will save and restore ACL settings on files.

Directories are actually files in UNIX that have a predefined structure that creates a linkage or map between file names and "inode" indices. "inode" entries contain information about the file such as file location, permissions, owner, and group. It is possible for multiple file names to have the same inode number, and this is a special file type known as a "link." Both file names actually reference the same physical locations on disk (or the same physical device). A directory file (like a standard file) has a set of permissions associated with it. For a directory, these permissions have different interpretations, however:

| | |
|---|---|
| **Read** | permits listing the filenames contained in the directory (via the ls and other commands). |
| **Write and Execute** | permits changing or removing file names in a directory. |
| **Execute** | permits access to the files which are referenced by file names in the directory (inode). |

If a user is allowed write and execute to a directory, any file in that directory can be removed, regardless of the individual file permission settings. This combination also allows renaming files and creating new files in the directory — allowing the possibility of a user creating unwanted files in a directory, which could compromise system security (i.e., a Trojan horse). Removing read access from a directory removes the capability of listing the file names. However, a specific file could still be accessed if the name was known and file-level access granted access. Some UNIX subsystems take advantage of this ability for maintaining security while still allowing some access.

Home directories of users, defined in the /etc/passwd file, should not be writeable by all users, since a file could be added or removed by any user on the system. A command to check for writeable directories that are 'home' to a user is:

```
$ find `awk -F: '{print $6}' /etc/passwd` \
       -prune -perm -02 -exec ls -ld {} \;
```

The PATH variable, which is usually set in either the global profile script or the user script, identifies the directories the user's shell program will search when attempting to execute a command or script. If the user does not qualify a command or script name (by specifying the directory in which the file is located), the shell will by default search each directory in the PATH variable for the specified name. This functionality makes using UNIX much easier, but also opens the door for potential disaster. For example, if the PATH variable consisted of the directory "." (meaning the current directory) or any world-writeable directory, a file or script could be executed that was not intended by the user. In the current directory, a file named 'ls' could exist that would remove all files in the directory. When an unsuspecting user in that directory attempted to list the files (or so they thought), all files for which the user had write permission would be removed. This use is fairly obvious; however, consider the same PATH variable set for the root user. A script with the same name as one or more common commands could exist that performed some function such as creating a new user id with super-user privileges, and then executed the original command. The unsuspecting user would not even know that the bogus script had been executed. Therefore, the PATH for super-users should contain only the directories '/bin' and '/usr/bin', with appropriate security maintained on each of those directories.

With this in mind, the user-level profile (.profile or .login) should contain at least the following security related commands:

- Ensure the PATH variable is set securely
- Use umask to set greater restrictions on new files
- Display the last time this user logged on

This could be accomplished with the following shell script portion:

```
PATH=/bin:/usr/bin
export PATH
umask 27
set - `ls -lc .last_login`
echo "The last record login was on $6 $7 at $8"
touch .last_login
```

A user's login startup script should not allow modification by anyone else on the system. To verify compliance use the following commands:

```
$ find `awk -F: '{printf %s/.profile\n", $6}' /etc/passwd` \
      -prune -perm -022 -exec ls -l {} \;
$ find `awk -F: '{printf %s/.login\n", $6}' /etc/passwd` \
      -prune -perm -022 -exec ls -l {} \;
$ find `awk -F: '{printf %s/..cshrc\n", $6}' /etc/passwd` \
      -prune -perm -022 -exec ls -l {} \;
```

### Device Files

In UNIX, like MPE, physical devices are referenced and accessed via standard file names. However, unlike MPE, UNIX actually has a file that exists in the directory for the devices on the system, including device files that refer to memory, networking interfaces, swap areas, and kernel (Operating System) virtual memory. Granting access to these files allows access (read/write) to the devices themselves. By convention, these device files reside in the /dev directory, although a device file could exist in any subdirectory.

Unsecured device files not only open up the possibility of a hacker being able to read any portion of the disks or memory, but also provide the ability to write over any data contained on a device, thus potentially destroying data or the operating system itself. In general, make sure that any disk, memory (/dev/mem and /dev/kmem) and other device files are secure from all "other" access (i.e., chmod 600 <files>). One exception may be to allow greater access to a magnetic tape or cartridge tape drive file, depending on the operating environment. The owner of these files should be 'root', and the group id 'sys'. Changing the group id associated with a set of device files would allow certain classes of users access to devices. For example, an 'operator' group may allow access to the tape device files for backup and recovery purposes for those user ids that are members of the group. ACLs could also be used further to define access by a specific set of users for special purposes. For management purposes, device files should reside only under the /dev directory. The following command will locate any block or character device file on the system:

```
$ find / -hidden -name /dev -prune -o \( -type b -o \
      -type c \) -exec ls -l {} \;
```

Directly attached terminal devices also have a device file associated with them, known as a 'tty' device (since the name usually begins with the letters 'tty'). The permissions and owner/group ids of these device files are modified during the login process to allow access for the current logged-on user. Typically, the "other" write permission is also allowed — this permits any user on the system to send messages directly to your screen through the write command (or directly by accessing the device file). This write permission can be disabled using the mesg n command (mesg y re-enables write access). This is similar to "SETMSG OFF/ON" in MPE/iX, which disallows a terminal from receiving messages from users via the "TELL" command. As soon as the user logs off the system, the ownership of the tty device file is changed back to 'root'.

### Set User ID (setuid) and Set Group ID (setgid)

There are two additional flags maintained as part of the file permission settings known as the setuid and setgid bits, identified by the letter 's' or 'S' in the owner-execute (for setuid) or group-execute (for setgid) positions of the file permission settings.

Whenever a program (or shell script) is executed, there are four numbers associated with that process: the real and effective user id, and the real and effective group id. During the login process the real and effective id pairs are set to the user id and group id from the /etc/passwd file for the user name. However, when a user executes either a setuid or setgid program, the corresponding effective id is changed to that from the inode of the file. The user then has temporary rights and privileges of the file's owner and/or group.

The most dangerous case exists for "setuid to root" programs and shell scripts. In this case the owner of the file is the root user and the setuid bit is set (this bit can be set via the chmod command), and the executing user will temporarily have super-user privileges, until the program terminates. Certain programs within UNIX use the capability to perform required work, such as passwd, which requires temporary super-user rights to be able to change the password field in the /etc/passwd file. Setuid or setgid shell scripts should never be used or exist, since they represent a large potential security problem. It is much easier for someone to change a shell script to add "hidden" functionality than it is to modify an executable file. A common tactic used by hackers of UNIX systems is to create a copy of one of the standard shell programs in a directory in which any user has execute access to program files and change the owner to root and set the setuid bit. From then on, any knowing user can execute the setuid-to-root shell and gain complete access to files and commands. As described above, this act of copying and changing modes could actually be performed by a legitimate super-user without their knowledge, if the PATH variable is not set properly.

To locate setuid and setgid programs on the system, the following commands could be used (setuid-to-root programs could be critical, setuid to other users is less critical, but both should be investigated):

```
$ find / \( -perm -4000 -o -perm -2000 \) -exec ls -ld {} \;
```

### Monitoring System Activity

Maintaining a secure system is a process, and aside from establishing the policies, procedures, and controls to restrict access to the system and resources, continual monitoring of the activity on the system is required to ensure compliance with the policies. This involves examining system logs for various activity and extraordinary circumstances, identifying modifications to established security controls, and, in general, isolating attempts to defeat the security mechanisms of a system.

UNIX systems can be enabled to log both successful and unsuccessful attempts at logging onto the system. The following log files can exist on the system to record access information:

| LOG FILE | TYPE OF INFORMATION | ACCESSED BY |
|---|---|---|
| **/etc/utmp** | Records which users are currently logged on (similar to JMAT table in MPE) | who command |
| **/etc/wtmp** | Records each login and logout information | who /etc/wtmp<br>/etc/last (matches login and logout records to show time logged on) |
| **/etc/btmp** | Records unsuccessful login attempts | /etc/lastb |
| **/usr/adm/sulog** | Records successful & unsuccessful attempts to "switch user" with the su command | more (file is ASCII readable) |

These files are only written to by the login and su programs if they already exist, otherwise no record is maintained. To create these files, log in as root and touch each of the file names to create them (i.e., touch /etc/wtmp /usr/adm/sulog). These logs are similar to the logging of "Job Initiation" and "Job Termination" events within the MPE logging facility.

HP-UX also has additional accounting facilities for logging a variety of additional information. This accounting information can be enabled (usually at boot time in the /etc/rc file) by executing the /usr/lib/acct/startup command. Additional process-level logging information is recorded in various files, including /usr/adm/pacct. The HP-UX accounting facility includes a number of utilities to provide formatting and summarizing of the logged information, including:

| | |
|---|---|
| **acctcms** | Produce command execution summary report (used by runacct) |
| **acctcom** | Produce detailed process reports from /usr/adm/pacct (used by runacct) |
| **acctcon1 and acctcon2** | Generate connect time information reports (used by runacct) |
| **acctprc1 and acctprc2** | Generates CPU usage information by user id (used by runacct) |
| **acctdusg** | Calculates disk usage by login name |
| **ckpacct** | Checks the /usr/adm/pacct log file. If it has exceeded a specified size, the existing log is renamed and a new one is created (similar to SWITCHLOG in MPE) |
| **dodisk** | Checks current disk space usage and creates a "snapshot" of the information |
| **monacct** | Produces monthly accounting report files |
| **prdaily** | Generate previous day's accounting report |
| **runacct** | Produces daily accounting reports |
| **startup** | Enables logging of additional accounting information |
| **shutdown** | Appends a shutdown record and disables logging |

These accounting commands and utilities are typically used in conjunction with cron (the batch scheduler) to execute accounting report daily (and/or monthly) and to monitor the size of the log files. These tools can provide very detailed historical information of activity of users on the system and may be very useful in determining a sequence of events in the event of a security break-in.

In addition, HP-UX can be converted to a "Trusted System" fairly easily using the "SAM" utility. Prior to converting to a trusted system, all known potential security holes should be removed, permissions modified, and user ids validated. Once you have converted to a trusted system, the only way to remove this state is to re-install the operating system.

Once executing in a trusted state, additional auditing features are available to the system administrator. These include:

- Ability to audit specific user ids
- Audit logins, run state changes
- File permission changes, acl and ownership changes
- Administrative commands, file creation, deletion and access, process creation and termination
- User-defined logging events
- Some network related events (socket level calls)

Certain programs, utilities and portions of the kernel have been instrumented to capture and log these events when executing as a trusted system. Primary and secondary log files are maintained, and reporting tools are provided for analysis. However, auditing does increase system overhead, and performance considerations must be weighed against the security information. Selective logging of specific events can reduce the amount of overhead on the system substantially.

In order to assist the system manager in monitoring the integrity of system and application files, HP-UX allows a user to create "pdf"s or "Product Description Files." A pdf file contains information about a file or set of files on the system, including:

| | |
|---|---|
| **pathname** | Absolute pathname of file |
| **owner** | Either symbolic or numeric ID of user |
| **group** | Either symbolic or numeric ID of group |
| **mode** | Symbolic representation as displayed by the 'ls -l' command |
| **size** | Size of the file in bytes. Major and minor numbers are included for device files |
| **links** | Number of hard links to pathname |
| **version** | Numeric value, reported by the what(1) command |
| **checksum** | File contents computed by a checksum algorithm. This field reflects the slightest change to a file, even a single character |
| **linked_to** | Indicates whether the file has symbolic or hard links |

Using the command 'mkpdf' to create the pdf file, the system manager can later use this file to identify changes (file size, file contents, permissions, ownership, etc.) to critical files in the sys-

tem. Using the command 'pdfck', the system will compare the contents of the specified pdf file with the current calculated values of the files as they currently exist in the system. 'pdfck' reports any differences. 'pdfdiff' could also be used to compare two pdf files for differences and report those to the user. The system manager should pay particular attention to any report of modification to:

- Mode permission bits
- Owner ID and group ID
- Checksum differences

When HP-UX is installed or a new HP product is added to the system, a pdf file is automatically created for each 'fileset'. These pdf files are placed in a file '/system/<fileset>/pdf'—one file for each fileset (a fileset is a logical grouping of files for a particular HP-UX system component or application). A system manager could use 'pdfck' against these files to provide an integrity check of HP-UX's system files. If pdf's are used to check file integrity, ensure the pdf files are maintained in a secure directory.

### Network Security

Security of the networking components of a system (i.e., UUCP, NFS, ARPA/Berkeley services, NS, RPC, DCE) are unique to each service. Specific security issues relating to these products are not addressed by this article; however, if a system has any of these services installed, the security controls available should be reviewed, understood, and implemented since many of these services can gain access to a system without requiring the login process. Specific to review include:

- inetd.conf, /etc/services and inetd.sec file parameters and permissions
- .rhosts file usage
- hosts.equiv
- /etc/exports and /etc/netgroup
- Anonymous FTP capability

### Summary

This article has provided an introduction to many of the UNIX system security related issues that have surfaced over the years. It is the responsibility of the management of an organization and every user of the system to maintain security in their "operating domain." Without the full commitment of all involved, the task of maintaining a secure environment by a few individuals is difficult, if not impossible. Up-front planning through established policies and procedures is key to the successful implementation of security controls and the on-going monitoring and auditing activities required of the system administrator. These activities must become a standard operating procedure in the day-to-day maintenance of the system, and plans must be established in advance for handling and recovering from a potential security breach.

"An ounce of prevention is worth a pound of cure."

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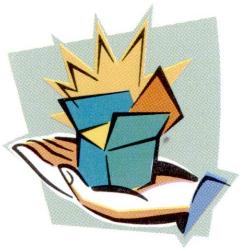

*Chris Hauck has been with Hewlett-Packard for the past 9 years. During that period he has focused on security and performance issues on both the HP 3000 and the HP 9000 families of systems.*


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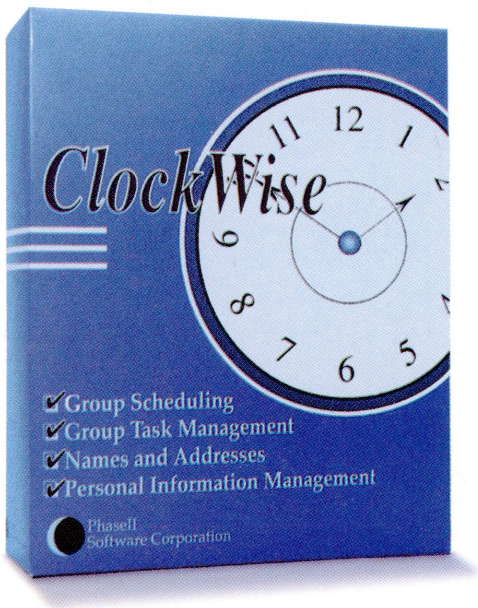


new products

## Group Scheduling Software

PhaseII Software Corp. has announced the immediate availability of its newest release of ClockWise for HP-UX and other UNIX platforms. The new release features improved name list handling in an address book style and an enhanced database design for interoperable UNIX and DOS/Novell environments. ClockWise 2.0 for Novell and PC/NFS is targeted for general availability in the first quarter of 1993.

ClockWise extends many personal information manager features such as calendars, notes, to-do lists, and address books to a group of people. ClockWise is designed to help groups avoid scheduling conflicts, to help managers delegate and monitor projects and tasks, and to maintain a complete record of company activities.




*ClockWise Group Scheduling software*

DOS/Novell interoperability enables users to share calendar access across the UNIX and DOS platforms. The user interface will be the same for users under each platform.

Name and address enhancements enable users to attach events, tasks, and messages to contact names to keep track of client histories along with name and address information. The name and address database may be shared among users.

Messages, a communication capability combining attributes of a bulletin board system and e-mail, allows messages to be posted and edited by a group of users and logs the time of communications. Messages, events, and tasks may be grouped together as part of a project, so all the information relating to an activity may be kept and recalled easily.

International time and data formats enable users in countries other than the U.S. to use ClockWise in a form that is familiar to them.

Other features and improvements in ClockWise 2.0 include: (1) expanded security to six permission levels controlling access to the schedules; (2) customizable printout style sheets; (3) expanded group handling to more than 1,000 users; (4) an expanded array of defaults for personalized use; and (5) free-time search, which can find the best fitting time for scheduled events.

Floating license cost depends on the number of workstations, terminals, or other displays connected to the system. The number of tokens represents the number of users who may simultaneously access ClockWise. All systems allow an unlimited number of users to sign onto the system, but not all at the same time (subject to hardware or operating system limitations). A suggested number of users suitable for each system is given with the price:

| | | | |
|---|---|---|---|
| 1 Token | suitable for 1-2 users | (1 manual) | $279 |
| 3 Token | suitable for 3-8 users | (2 manuals) | $499 |
| 5 Token | suitable for 5-15 users | (3 manuals) | $759 |
| 10 Token | suitable for 10-30 users | (3 manuals) | $1,359 |
| 25 Token | suitable for 25-75 users | (3 manuals) | $3,159 |

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- 1/4-inch tape, $20, TK50 tape, $30
- License upgrades range from $265 to $3,000, depending on number of additional users. At least one system is needed for upgrade Pak.

*For more information, contact PhaseII Software Corporation, 444 Washington St., Suite 407, Woburn, Massachusetts 01801, ph: 617/937-0256, fx: 617/937-0098.*

### New GUI Shop Floor Data Manager

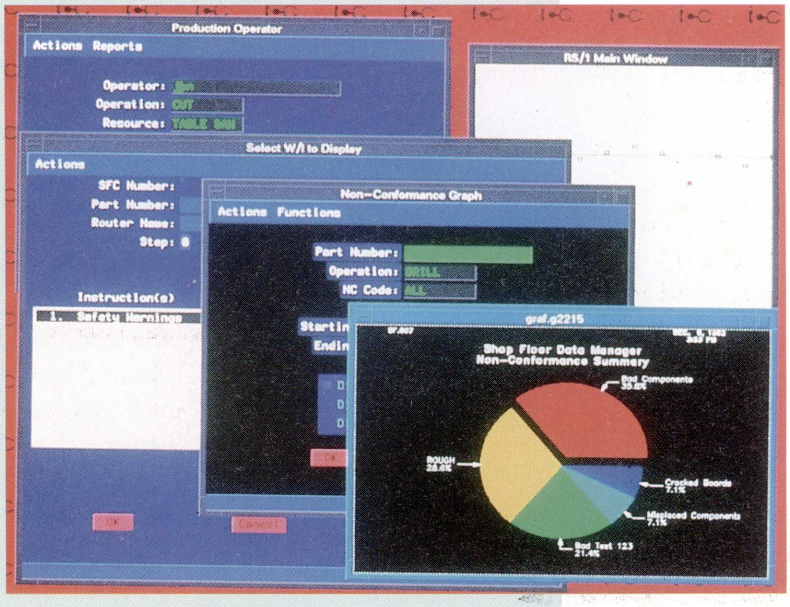
Industrial Computer Corporation (ICC) has announced its new OSF/Motif graphical user interface (GUI) and complimentary character terminal windowing system for its Shop Floor Data Manager (SFDM). The GUI is designed to provide maximum performance and long-term flexibility and to enhance ease of use across user interfaces without end-user retraining. This is not just a frontend, but a windowing system built right into the application. The new user interface is slated for release in the first quarter of 1993.

Shop Floor Data Manager/SFDM is a powerful manufacturing execution system for discrete industries such as automotive, electronics, and aerospace. SFDM addresses key manufacturing issues: resource and labor management, product and material traceability, and mission-critical data collection. The system collects, monitors and validates shop floor information in real time using character and OSF/Motif windowing systems, bar code readers, laser readers, RF terminals, workstations and other devices in a client-server environment. In addition, SFDM integrates easily with COMMS/MRP II, PLCs, cell control systems and a variety of SQL database systems including Oracle, Informix, and Ingres.

The core of SFDM is a central database that contains design details, packaging requirements, specifications, routings, and a model of factory processes. The solution is built upon ICC's CAP TURE application enabler, which provides a flexible framework that can be easily adapted to future changes in manufacturing, business, and technology.

ICC's solutions run on Hewlett-Packard's HP 9000 Series 700 and HP 9000 Series 800 systems. ICC is a Hewlett-Packard Premier Solution partner (PSP).

*For more information, contact ICC, 5871 Glenridge Drive, Suite 300, Atlanta, Georgia 30328, ph: 404/255-8336, fx: 404/250-0602.*




*ICC's shop Floor Data Manager with new GUI*

### Database Browser for Sybase

Bluestone Products and Relaview have announced the February availability of the newest release of db Viewer, version 1.8, an OSF/Motif-based database browser for Sybase. With db Viewer users can browse, update, insert, and delete information through an easy-to-use graphical interface. Version 1.8 also allows users to format and print custom-formatted results, commit and roll back transactions, and retrieve multiple results from stored procedures. It also has an improved user interface.

db Viewer is designed to provide easy, quick database access, graphical displays of tables and views, and queries for instant access and updates. Programmers save application development time by being able to simply generate, test, and save SQL queries.

The developer's kit costs $1,495, and a user license is $495. Volume discounts are available.

db Viewer was developed by Relaview and is marketed, distributed, and supported by Bluestone.

*For more information, contact Chris Baeckstrom, Bluestone Products, 1200 Church Street, Mt. Laurel, New Jersey, 08054, ph: 609/727-4600, fx: 609/778-8125.*

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**ad • vo • cate:** to plead in favor of, *see support*

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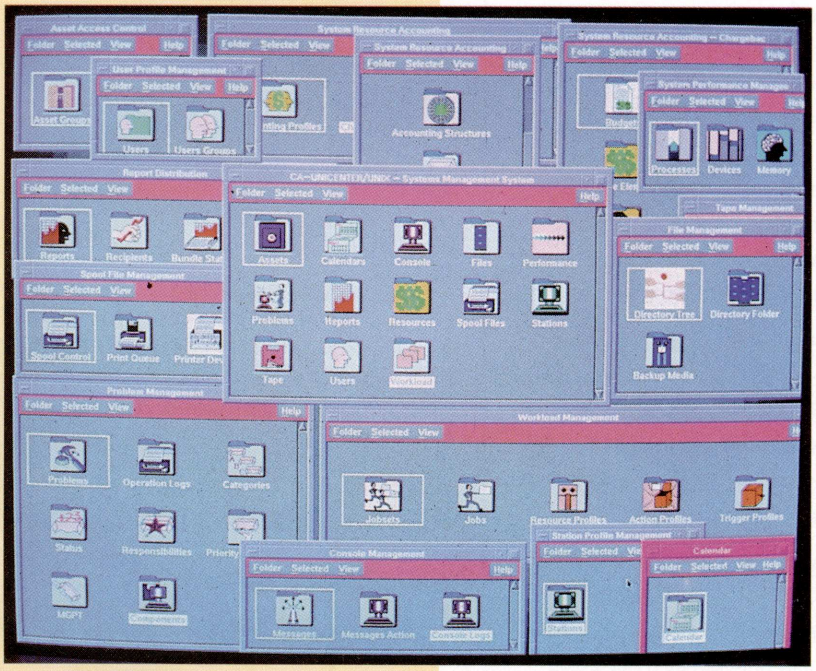
Computer Associates International, Inc. has announced that CA-UNICENTER, its systems management product for mission-critical applications, will be generally available first quarter 1993.

CA-UNICENTER is reportedly the first commercial grade solution for UNIX systems management, providing automation, cost savings, and data integrity. Key features include: backup and archiving, tape protection and management, workload management, console automation, report distribution, help desk, performance management, print spooling, security (including control of the powerful superuser), and resource accounting and chargeback.

CA-UNICENTER employs single-point, object-oriented systems and security administration, allowing all functions to interoperate and be easily accessible. Common ANSI relational database and security administration are designed to allow all functions to interoperate and be easily accessible.

A common ANSI relational database stores all information making data required to manage the UNIX environment as easily accessible as systems functions. The ability to integrate value-added products is another benefit. For example, CA was able to include the CA-20/20 graphical spread sheet as an integral part of CA-UNICENTER without any extra development effort.

An intuitive OSF Motif graphical user interface offers ease of learning and use. Comfortable switching between modules or between networked computers is another benefit. Because the user interface is separated from the product, conversion to OS/2 and Presentation Manager can be accomplished quickly and with few problems, the company notes.



*CA-UNICENTER for UNIX systems management*

A common host event notification facility (ENF) acts as a bulletin board for key systems information for all CA-UNICENTER components. Acting as an invisible "traffic cop," ENF buffers CA-UNICENTER from operating system dependencies.

CA-UNICENTER is currently available in BETA status on HP-UX. Pricing starts at $4,000.

*For more information, contact Computer Associates International, Inc., One Computer Associates Plaza, Islandia, New York 11788-7000, ph: 516/342-5224, fx: 516/342-5329.*

## NetWare Emulation Software

Puzzle Systems Corporation has ported its SoftNet Utilities NetWare emulation software product to HP 9000 Series 700 and 800 UNIX platform families.

In addition to its existing UNIX capabilities, SoftNet Utilities provides HP Apollo Series 700 and HP Series 800 systems with NetWare 2.2 and 3.11 server emulation, allowing them to also perform as Novell-compatible file servers to PC NetWare clients.

PC NetWare clients can directly and transparently access the UNIX file system and printing resources without the requirements of UNIX disk participating, reconfiguration of the UNIX kernel, or adding drivers to the PC NetWare clients. Likewise, HP workstation users can also easily send their print jobs to the NetWare print resources.

Pricing has been established at $1,295

*19th Annual*

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## HP-UX & Workstation Focus

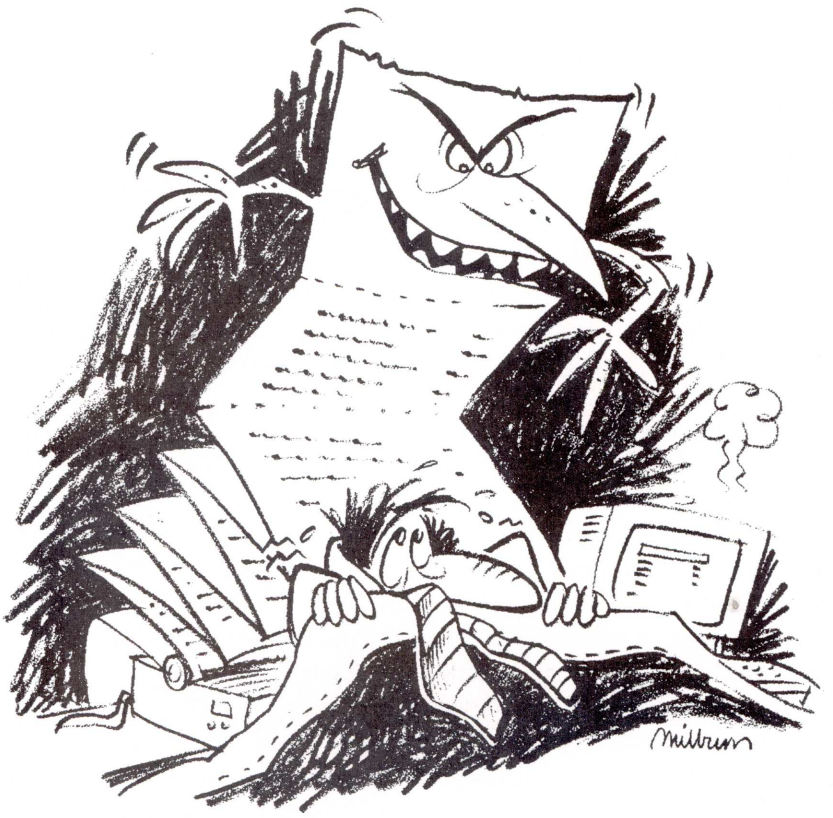
Since 1976, INTEREX has been the premier source of information about Hewlett-Packard computers and related products and services. The INTEREX HP Computer Users Conference & Expo will be held September 19-23, 1993 at the Moscone Center in San Francisco, California, and is the largest gathering of HP users.

Daily conference themes include; Future Strategies, Object Database Technology, Open Systems, and "Rightsizing". A plenary or Keynote session will be offered each day covering the major themes.

We have put special emphasis this year on the HP-UX and Workstation tracks. These tracks will focus on topics such as: Networking, Graphical User Interfaces, Application Development, System Administration, Evaluating Systems, Migration, Client-Server, Commercial Applications, and X Terminals.

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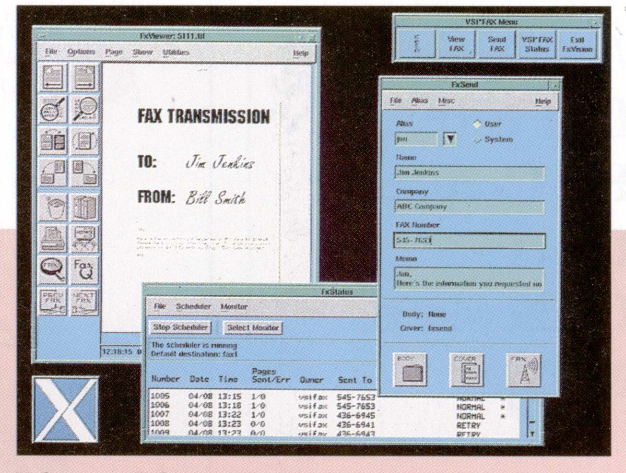
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*V-Systems FxServer 2.0*

### UNIX Fax Software

V-Systems Inc., developer of the VSI FAX UNIX facsimile system, has officially announced the availability of FxServer 2.0, a highly integratable computer fax solution for the HP 9000/7XX and 8XX Systems. Two other models have also been announced: FxVision, a complete X Window-based fax management system, and FxScript, a PostScript-compatible interpreter for fax.

FxServer 2.0 is designed to be easily integrated with any software application in the same way as the UNIX line printing utility, performing its job much the same as the lp spooler. Applications that print directly to "lp" may be configured to use a remote printer interface, which automatically handles routing of the fax transmission to the server. This enables developers to customize their systems with fax capabilities and enables end users to fax directly from existing applications.

FxServer significantly upgrades version 1.2 introduced in mid-1991 with group requests, VGA viewing capability, Class II modem support, a menu-driven interface, automatic cover sheet generation, and fax printing support from Postscript and Epson printers.

FxServer schedules fax transmissions and manages fax receipts. Functions include file conversions, directory management, scheduling, and fax activity logging. Customized cover pages can be created using company logos, personal signatures, and optional memos. ASCII and image files can be combined in any document to be faxed. Group broadcasts can be faxed with individual cover sheets, and users can be informed when their fax transmissions have been completed. In addition, FxServer notifies users of inbound transmissions, stores all inbound fax images to the UNIX file system, and optionally routes the images to other users or printers depending on the identification given to the sending fax machine.

FxVision, based on the Motif library and style guide, enables the user to view, send, receive, print, archive, and manage fax documents using pull-down menus, option lists, and standard defaults. Faxes can be sent with modifiable preformatted cover sheets. Received faxes also can be notable and distributed to other users throughout the network.

FxScript, a PostScript-compatible interpreter, allows users to fax PostScript documents directly from applications that support the page description language such as FrameMaker, WordPerfect, Lotus 1-2-3, and Corel Draw. FxScript allows for the full decryption, decoding and rendering of Adobe Type I fonts with hints, and provides facsimile output resolution of 200 x 200 or 200 x 100 dpi.

FxServer now supports the MultiTech line of class II fax modems.

Prices for the HP 9000 7XX are $1,495 for FxServer, $795 for FxVision, and $395 for FxScript. Prices for the HP 9000/8XX are $1,895, $995, and $595, respectively.

*For more information, contact V-Systems, Inc., 39 Brookhollow Drive, Santa Ana, California 92705, ph: 714/545-6442, fx: 714/545-7653.*

(16 concurrent user license), $1,995 (32 concurrent user license), $2,995 (64 concurrent user license), $3,995 (100 concurrent user license), and $5,495 (250 concurrent user license). The products are now available from authorized Puzzle Systems resellers and distributors worldwide.

*For more information, contact Puzzle Systems Corporation, 16360 Monterey Road, Suite 250, Morgan Hill, California 95037, ph: 408/779-9909, fx: 408/779-5058.*

### OCS Distributors in Europe And South America

Operations Control Systems has signed agreements to distribute its data center management products in the U.K., the Netherlands, and Brazil. Products included under these agreements are: CHARGEBACK-UX for cost allocation and resource management, PRIVATE for password management and access control, TAPE for tape library management, and CrossLink for remote command initiation on UNIX systems.

The partners in these agreements are Orion Europe Ltd., Stellingwerf Beintema B.V., and Exempla Informatica.

*For more information on OCS products in the U.K., the Netherlands, or Brazil, contact:*

*Orion Europe Ltd., 4 Troon Close, Sutton Coldfield, West Midlands B75 6UQ U.K. ph: 44 21/311 1841 fx: 44 21/311 1862*

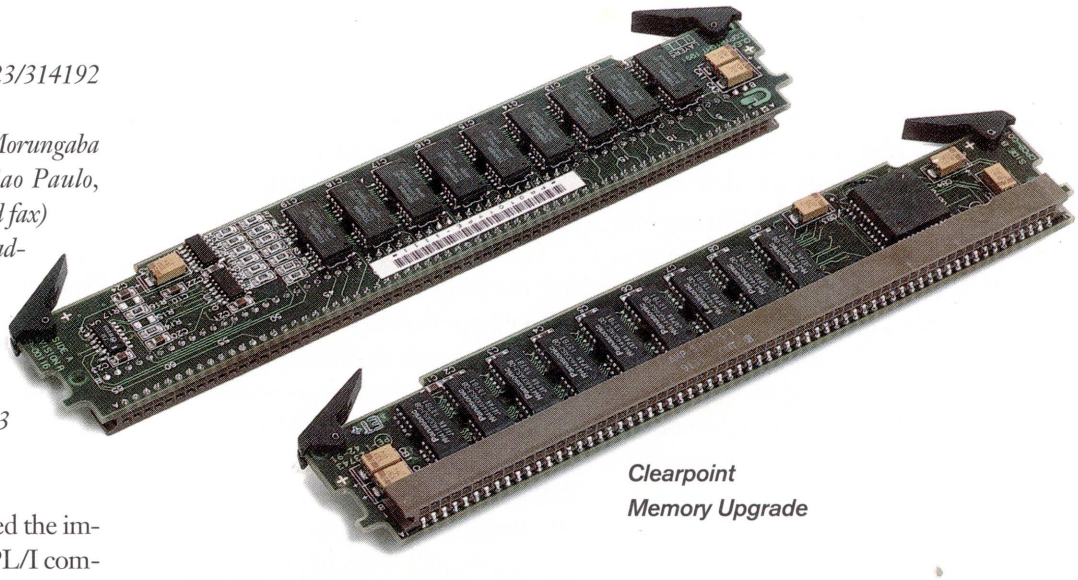
*Stellingwerf Beintema, Zijlweg 144, 2015*

*BH Haarlem, Netherlands ph: 31 23/314192 fx: 31 23/325993*

*Exempla Informatica, Praca Morungaba 156, Jardim Europa, 01450 Sao Paulo, Brasil 55 11/282 5645 (phone and fax)*

*To contact OCS worldwide headquarters:*

*Operations Control Systems, 560 San Antonio Road, Palo Alto, California 94306 USA ph: 415/493-4122 fx: 415/493-3393*



*Clearpoint Memory Upgrade*

## PL/I Compiler

Liant Software has announced the immediate availability of its LPI-PL/I compiler with CodeWatch X/Motif-based debugger on HP's PA-RISC-based workstations.

LPI-PL/I enables programmers to downsize existing PL/I applications originally developed on proprietary IBM and Digital computers to UNIX systems. It provides a high productivity development environment for HP Apollo 9000 Series 700 workstations. The product evolved from a joint effort with HP.

LPI-PL/I applications developed on machines such as Sun's SPARCstation, Intel 386 and Intel 486-based platforms, and IBM's RS/6000 workstation are source-code compatible with HP Series 700 workstations. A common language across multiple architectures allows the developer to easily support a multiplatform computing environment.

The LPI-PL/I compiler conforms to the 1981 ANSI PL/I General Purpose Subset standard and contains numerous extentions to aid programmers in porting applications.

CodeWatch, an X/Motif source-level debugger, provides an interactive debugging environment and uses the symbols and conventions of the source language. It is bundled with all Liant LPI-series compilers.

LPI-PL/I and CodeWatch for HP Apollo 9000 Series 700 workstations is available immediately with a U.S. single-user list price of $2,995.

*For more information, contact Liant Software Corporation, 959 Concord Street, Framingham, Massachusetts 01701-4613, ph: 872-8700, fx: 508/626-2221.*

## Memory Upgrades

Clearpoint Research Corporation has announced memory upgrade kits for HP's new 9000 workstations Series 715, 725/50, 735, and 755.

According to the company, the offerings include the industry's first 128 MB SIMM for the Series 715, 725 and 730, as well as a 128 MB upgrade for the Series 750 and 755. The 128 MB upgrades use 16 MB DRAM technology and Clearpoint's patented mother-daughter card design.

Other HP memory upgrades announced are 8 MB, 16 MB, 32 MB, and 64 MB upgrade kits for Series 3000 and 9000 systems. Overall, pricing ranges from 20 percent to 40 percent below memory upgrades offered by Hewlett-Packard, the company notes.

The 128 MB upgrade kits for the HP 9000 Models 725 and 750 will be available in March 1993. Prices for the upgrades are as follows:

| System | Product (upgrades) | List Price ($) |
|---|---|---|
| HP 3000 Models 9X7 | HPME-897/16 (16 MB) | 2,100 |
| 9000 Models 8X7 | HPME-897/32 (32 MB) | 4,500 |
| | HPME-897/64 (64 MB) | 8,300 |
| HP 9000 Models 715, | HPME-725/16 (16 MB) | 1,800 |
| 725/50,735 | HPME-725/32 (32 MB) | 4,114 |
| | HPME-725/64 (64 MB) | 9,200 |
| | HPME-725/128 (128 MB) | 17,900 |
| HP 9000 Model 755 | HPME-725/16 (16 MB) | 1,800 |
| | HPME-750-32 (32 MB) | 3,857 |
| | HPME-750-64 (64 MB) | 7,600 |
| | HPME-750/128 (128 MB) | 15,500 |

*For more information, contact Clearpoint Research Corporation, 35 Parkwood Drive, Hopkinton, Massachusetts, 01748, ph: 508/435-2000, fx: 508/435-7504.*

## Remote Watch

HP has announced an enhancement to its multivendor systems-maintenance offering. HP RemoteWatch, a systems monitoring tool, saves system administrators

time by automating routine system monitoring activities and proactively assisting with problem identification and resolution. HP RemoteWatch was first introduced several years ago for HP's single-user, networked workstations and was extended in June of 1992 to cover HP's UNIX system-based servers. Now HP RemoteWatch on Sun is available to assist system administrators and HP support engineers in Sun SPARC environments.

HP RemoteWatch will now monitor mixed networks of HP-UX systems and Sun SPARCsystems from a single system. The software provides system administrators with fast, easy access to system information and sends notification daily if configuration changes occur. System components monitored include system CPU and backplane, mass storage devices, line printers, LAN cards, diskless clients, log and core files, file system security, and the operating system kernel.

HP RemoteWatch is designed to reduce system downtime by proactively identifying and notifying system administrators of system problems via electronic mail. Typical messages include notification that system disk space is nearly exhausted, log files are too large, printers are disabled, LAN error rate thresholds have been exceeded, or a system error has occurred. Critical messages are mailed immediately, and all messages are archived to provide system administrators and HP support engineers with the information necessary to expedite problem resolution.

In addition, the tool provides the following innovations:

- treats the server, clients and peripherals as one complete system
- accesses information from the systems managed by a system administrator using networking daemons that eliminate the need to log on
- uses a Motif-based graphical user interface to display a logical map of systems allowing system administrators to access all systems worldwide from a single kit

HP RemoteWatch on Sun is offered free of charge to all customers who have HP hardware maintenance service coverage for their Sun systems. Sun hardware maintenance is one of the many multivendor maintenance capabilities HP offers.

### CDDI Adapters for HP/Apollo Workstations

Crescendo Communications has announced what is reported as the first 32-bit EISA (Enhanced Industry Standard Architecture) adapters for the HP/Apollo Series 700 workstations that support Fiber Distributed Data Interface (FDDI) over unshielded twisted pair (UTP), shielded twisted pair (STP), and fiberoptic cable.

The EISA Adapter, C321M-HP FDDI EISA Adapter, C325 CDDI EISA Dual-attach Option, and C316M FDDI EISA Dual-attach Option provide 100 Mbps connections for an HP workstation to any FDDI or CDDI concentrator, such as the Crescendo Workgroup Concentrator. Single-attach adapters require a single slot. The dual-attach option requires a second slot. All products support the Simple Network Management Protocol (SNMP) agent and are compatible with SNMP-based network management platforms such as HP's OpenView.

Also announced is an SNMP network management application, the C1802 Crescendo Manager for the HP/Apollo workstation to provide remote management of any Crescendo concentrator on the network, using a graphical representation of the concentrator front panel.

The adapters are designed to provide high data throughput with custom Very Large Scale Integration (VLSI) logic and an on-board processor to handle FDDI Station Management (SMT) network overhead. The on-board processor keeps the node on the FDDI ring even if the workstation experiences a system crash.

Crescendo also reinforced its intention to provide a low-cost upgrade for its EISA adapters when the emerging ANSI copper-FDDI standard is finalized. Customers are assured an upgrade to the twisted pair standard that is a daughter module at no more than 10 percent of the list price of the CDDI product.

In June 1992, the ANSI standards subcommittee decided to use Crescendo technology as the basis for a new standard for FDDI on twisted pair. A draft standard is expected in 1993.

The C320-HP CDDI EISA Adapter has a list price of $1,995. The C321M-HP FDDI EISA Adapter lists for $2,995. The C325 CDDI DAS and C326_M FDDI DAS options are available for $695 and $1,395. The C1802 Crescendo Manager for HP is available for $895. All products will be available on March 15, 1993.

Other products available from Cre-

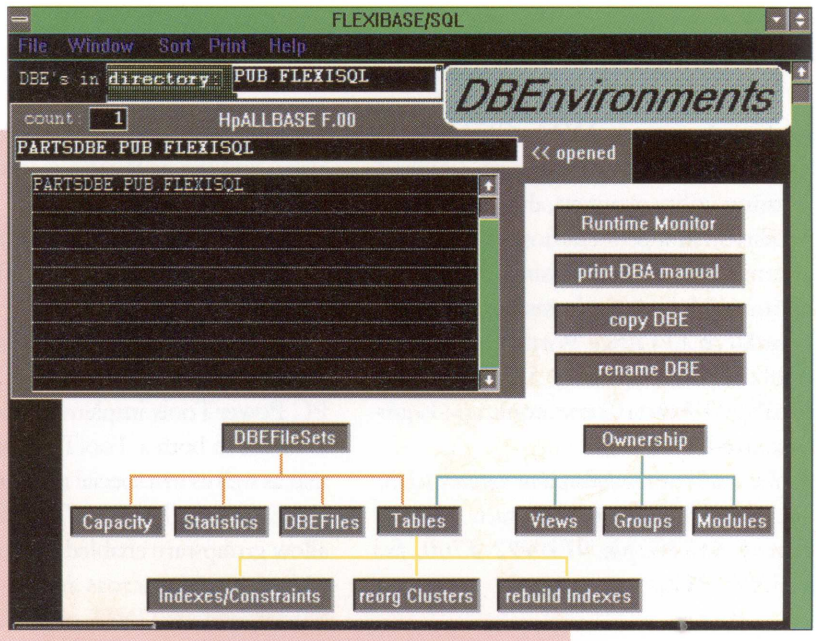
**ATTENTION VENDORS**

New product announcements should be sent to Michelle Pollace, New Products Editor, *hp-ux/usr*, INTEREX, P.O. Box 3439, Sunnyvale, California 94088-3439, USA.

### Flexibase Releases for HP-UX

Proactive Systems has announced a new release of FLEXIBASE database administration software. FLEXIBASE supersedes Proactive's FLEXIBASE/3000 database for IMAGE/3000 databases to provide the same high level of functionality for both IMAGE and ALLBASE/ SQL. The latest release of FLEXIBASE/SQL (Version A.05.01) is now available for ALLBASE/SQL on both the HP 3000 and the HP 9000 systems. FLEXIBASE/SQL is a DBA tool that uses the latest client-server technology and an MS-Windows GUI front end. It provides a complete set of functions, including comprehensive information displays, object dependency analysis, and DB Environment management utilities.

The latest release of FLEXIBASE/ IMAGE (Version D.01.02) includes a number of important new features: improved diagnostic recommendations which now take account of the operating system version; an interactive transmute function which allows the database administrator to modify a database outline and include a facility to optimize blocking factors automatically throughout the database; full support for the latest IMAGE features announced with MPE/iX 4.0, including E-type data items and third-party indexing; increased speed of several major functions; and new distribution in Spanish, as well as continued distribution of English, French, and German versions.




*Main Menu screen of Flexibase/SQL*

*For more information, please contact Proactive Systems, Four Main Street, Los Altos, California 94022, ph: 415/949-9100, fx: 415/949-9111.*

scendo are CDDI/FDDI wiring concentrators, SBus adapters for SUN SPARCstations, Micro Channel adapters for the IBM RS6000s and EISA adapters for PCs and servers.

*For more information contact Crescendo Communications, 710 Lakeway Drive, Sunnyvale, California 94086-4058, ph: 408/732-4400, fx: 408/732-4604.*

### DOS/UNIX File Transfer

Almost any PC connected via serial hardware can now transfer files and other data between any of the popular UNIX-type systems using EmPath, a new communications software package now available from LDS, Inc.

With a user-defined hot-key, EmPath permits switching from DOS to UNIX and back again from the DOS prompt without exiting applications running on either side. In addition, EmPath enables DOS users to connect with two separate UNIX-type operating systems and have both online simultaneously. Up to eight different logical sessions at each of the two remote UNIX sources can be accessed. EmPath also enables DOS to be copied by UNIX or UNIX files to be copied by DOS. Using EmPath, a printer attached to a PC can print files directly from UNIX. For reference purposes, EmPath will also store or print any screen image. EmPath requires DOS 3.0 or greater, a minimum of 33K of available memory, a hard disk drive, and a serial port. EmPath permits the use of both DOS and UNIX-type operating systems without sacrificing either system's capabilities. Only one computer is needed for both DOS and UNIX functions.

Additional EmPath features include SCO ANSI color console emulation, non-resident mode capability, automatic distinction between text and binary files, buffered, interrupt-driven communications, support of line speeds up to 38400 bps, capture and replay of screen images, SCO-defined key remapping, support of automatic dialing, external communications interface, standard and enhanced

keyboard support, MDA, CGA, EGA, VGA 80x25 text mode support, attached printing utility program, dual session capability to independent hosts, up to eight alternate screens per session, communication with remote hosts and bulletin boards, SCO Office Portfolio support, and the WordPerfect 5.1 TRS file. EmPath is Arnet, Computone, and Equinox tested.

*For additional information, contact LDS, Inc., 10323 West 84th Terrace, Lenexa, Kansas 66214, ph: 913/492-5700, fx: 913/492-3506.*

### PowerTools Update

VXM Technologies has announced that new PowerTools software can unexpectedly offer a tremendous productivity boost to developers of groupware products.

Since the product's announcement, VXM has talked with a number of potential customers and realized that Power Tools could be used for developing groupware applications.

Without being repackaged or modified, PowerTools is designed to enable developers to easily link in the Power Tools libraries to facilitate the execution of distributed desktop groupware processes, handle reliable and sequenced message transmission and reception between desktops, do broadcasting to multiple desktops, handle groupware process synchronization, and facilitate shared memory between groupware applications across a TCP/IP network. Groupware processes can be initiated synchronously or asynchronously and can be conditioned to act depending upon the initiation or termination of another desktop groupware process (e.g., a calendar application). The ToolTalk support (analogous to a heterogeneous network DDE mechanism) offered by PowerTools allows the quick integration and transformation of otherwise standalone desktop applications into true distributed groupware systems.

PowerTools works on Sun, HP, DEC, IBM, and Silicon Graphics UNIX platforms.

VXM will make the product available for both MS Windows and NT. This new PC PowerTools implementation will be available in both a ToolTalk support format as well as in a special network-enabled DDE format. The ToolTalk format will allow groupware enabled by PowerTools to interoperate across a wide variety of heterogeneous UNIX and PC systems. The DDE PowerTools format will be available only for MS-Windows and NT systems. The MS-Windows DDE implementation will be available in March of 1993. The NT DDE implementation will ship in the second quarter of 1993.

Pricing for the MS-Windows and NT implementations of PowerTools will be announced at the time of the product's release. It is expected that the cost of the PC DDE implementation of PowerTools will be lower than that of the current UNIX version, the company notes.

*For more information, contact VXM Technologies, Inc., 30 Gardner Road, Suite 3G, Brookline, Massachusetts 02146, ph: 617/730-8490; fx: 617/734-8760.* ◧

## NEW FROM HP

### SoftBench Channel Partner Program

HP has announced it has established an HP Channel Partner program for Soft Bench in the United States. In response to strong market demand, HP has implemented this new distribution channel to supplement HP's direct sales force's efforts to make SoftBench environments widely available, particularly on Sun workstations.

In a related announcement, HP said it has signed an agreement with BASIS Inc. to sell $500,000 worth of C++ SoftBench 3.0 and SoftBench 3.0 products on Sun SPARCstations and other platforms as they become available. The contract with BASIS, an Emeryville, California-based open-systems integrator, is the first in a series of U.S.-based CASE Channel Partner agreements to sell the SoftBench family of products.

BASIS, along with future SoftBench Channel Partners, will receive SoftBench training and support from HP so that it can work directly with customers interested in purchasing the SoftBench environments. BASIS also will help customers integrate full software-development solutions.

HP's SoftBench code development environments are integrated with the de facto standard SoftBench framework, a platform that provides common communication services and interfaces among all tools in the environment. C++ SoftBench 3.0 and SoftBench 3.0 comprise an integrated set of tools that address the majority of tasks that software developers perform when constructing an application.

BASIS Inc., The Open Systems Integrator, is located in Emeryville, California, and is an independent integrator of open-systems computing technology, with extensive experience in systems design and consultation. A UNIX system vendor since 1981, BASIS delivers distributed computing systems, from workstations to high-end servers, for commercial enterprises and public sector organizations.



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